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MINERALOGICAL ABSTRACTS

Vol. 14—No. 4 December 1959

AGE DETERMINATION AND ISOTOPE MINERALOGY

AHRENS (L. H.). *Studies on the relative abundances of isotopes.* Geochim. Cosmochim. Acta, 1957, **11**, 1–27, 21 figs.

The distribution pattern of isotope abundance of an element varies with changing atomic number and certain minor regularities are noted. Elements with odd atomic number (Z odd) and, thus, even neutron numbers (N even) are considered together ; those with even atomic number are grouped according to whether N is even or odd. The relationship between elements of atomic numbers $Z=1$ to $Z=82$ and the N values of their commonest (single) isotopes is shown diagrammatically ; discontinuities are evident at $N=20$, 50 and 82. These values are highly favoured neutron numbers. S, Cl, A, K, and Ca have isotopes with $N=20$; Kr, Rb, Sr, Y, Zr, and Mo have isotopes with $N=50$; and Xe, Ba, La, Ce, Pr, Nd, and Sm all have isotopes with $N=82$.

J. R. B.

AHRENS (L. H.). *Analytical error as a possible cause of the $t(^{206}_{238}) > t(^{207}_{235}) > t(^{207}_{206})$ age distribution.* Geochim. Cosmochim. Acta, 1955, **8**, 299.

In many U-bearing minerals $t(^{207}_{206}) > t(^{207}_{235}) > t(^{206}_{238})$ where numbers indicate the atomic weight of the lead or uranium isotope measured to give an estimate of age. The minority distribution indicated in the title is more common for minerals low in U and where U has been determined gravimetrically. Thus U deficiency may be the result of chemical underestimation ; no redeterminations given. J. R. B.

NICOLAYSEN (L. O.). *Solid diffusion in radioactive minerals and the measurement of absolute age.* Geochim. Cosmochim. Acta, 1957, **11**, 41–59, 13 figs.

Solid diffusion of daughter products in Th and U minerals is one explanation of the common age discrepancy $t(^{207}_{206}) > t(^{207}_{235}) > t(^{206}_{238})$. A diffusion coefficient for Pb of 10^{-13} cm/yr in a theoretical crystal 2 mm diameter could give relevant ages of 965, 843, and 800 m.y. ; with a diffusion coefficient of 10^{-12} cm/yr (other conditions including temperature remaining similar) the ages would be 816, 511, and 450 m.y. Diffusion of both Th and U are neglected and the difference between diffusion coefficients of isotopes of the daughter element is shown to be negligible. A proof of the existence of daughter diffusion and an estimate of its importance would be revealed in the relationships of age pattern to crystal size in a Th-U mineral, crystallizing with a hundredfold size variation. The possible effects on the diffusion coefficient of the daughter element due to radiation damage and to the total concentration of daughter element are tentatively assessed. J. R. B.

AHRENS (L. H.). *Implications of the Rhodesia age pattern.* Geochim. Cosmochim. Acta, 1955, **8**, 1–15, 8 figs.

Most published Pb–U age distributions have $t^{207}_{206} > t^{207}_{235} > t^{206}_{238}$, and it is suggested that all these ages might fit the Rhodesia (convergent) pattern where $\log t^{206}_{238} = a t^{207}_{235} + b$, and a and b are constants. It would follow that most lead ages (even t^{206}_{207}) are underestimates. 10–20% Pb–U age distributions show $t^{206}_{238} > t^{207}_{235} > t^{207}_{206}$. J. R. B.

HOLMES (A.) & CAHEN (L.). *Géochronologie africaine 1956. Résultats acquis au Ier juillet 1956.* Mém. Acad. roy. Sci. colon., Classe Sci. nat., Bruxelles, 1957, no. 5, 169 pp.

Review of the methods used to determine the age of minerals. Numerous numerical data are given from which can be deduced the existence, for the whole of Africa, of 7 pre-Cambrian cycles, 3 Palaeozoic cycles, and 1 later cycle.

J. M.

SCHREINER (G. D. L.). *Comparison of the $^{87}Rb \rightarrow ^{87}Sr$ ages of the red granite of the Bushveld complex from measurements on the total rock and separated mineral fractions.* Proc. Roy. Soc. London, 1958, **245**, **A**, 112–117.

Age determinations on a portion of the total crushed rock of four samples of the red granite of the Bushveld, on the feldspar fraction of each rock, and on the biotite of one sample yield a mean age of 2410 m.y. ($t_{\frac{1}{2}} = 6{\cdot}3 \times 10^{10}$ years), or 1920 m.y. ($t_{\frac{1}{2}} = 5{\cdot}0 \times 10^{10}$ years). No variations between individual determinations are significant at the 99% confidence level, and it is concluded that the 'total rock' method is of general application to granites and mica-free

rocks. The isotope dilution technique of Jamieson and Schreiner [M.A. **14**–3] was used. It follows that the age of the Witwatersrand system is >2000 m.y., and exceeds that of the uraninite (1950 m.y.) found in various reef horizons within it. D. McK.

Bassoles (B.), Cosson (J.), Grassaud (J.), & Roques (M.). *Age apparent de la diorite quartzique des Saras dans le Mayombe (Afrique équat. fr.)*. C.R. somm. Soc. géol. France, 1956, p. 86.

The quartz diorite of the Saras is a syntectonic body in the series of sericitic schists of Loukoula. The age of the zircon of the diorite, determined by the lead-alpha method, is 1250 m.y. E. J.

[Moor (G. G.) & Zykov (S. I.)] Моор (Г. Г.) и Зыков (С. И.). Щелочные породы северной окраины Сибирской платформы и изотопный состав свинца в них. [*The alkaline rocks of the northern border of the Siberian platform and the isotopic composition of the lead contained in these rocks.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1959, **124**, 168–170.

In the region of rivers Kotin and Meimecha the igneous rocks, mainly of Triassic age, comprise lavas of basalt and dolerite as well as alkaline basalts, trachytes, and dacites, and stock-like and dyke intrusions of alkaline and ultrabasic rocks. The study of the isotopic composition of lead from galena contained in a syenite dyke, from Odikhinch on the R. Kotin, gave : $^{206}Pb/^{204}Pb$ 17·98, $^{207}Pb/^{204}Pb$ 15·36, $^{208}Pb/^{204}Pb$ 37·65. These figures are of the same order as those for the basic lavas of the region and it is tentatively assumed that both lavas and alkaline and ultrabasic intrusive rocks are derived from the same basaltic magma.

S. I. T.

[Moor (G. G.)] Моор (Г. Г.). О возрастных взаимоотношениях траппов и пород щелочно-ультраосновного комплекса севера Сибирской платформы. [*On the age relations between the traps and the rocks of the alkaline-ultrabasic complex of the north of the Siberian platform.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1959, **124**, 387–389.

The geological evidence suggests that the Siberian traps are of Permo-Triassic age and that the alkaline–ultrabasic intrusions are closely associated with the traps. Determination of the absolute age of these two groups of rocks, however, gave conflicting results ; for the traps 153–178 m.y. (Permian–Trias), and for the rocks of the alkaline–ultrabasic group, based on age-determination of the phlogopite, 231 to 292 m.y. (average 251·1 m.y., corresponding to Lower or Middle Carboniferous). S. I. T.

[Shur (A. S.)] Шур (А. С.). К аргоновой методике определения абсолютного возраста горных пород и минерало[в] [*On the argon method of absolute age determination [of] rocks and minerals.*] Изв. Акад. Наук СССР, Сер. Гео[л.] [Bull. Acad. Sci., U.S.S.R., Sér. Géol.], 1959, **6**, 109–11[1] 1 fig.

Employing six parallel and independent installations it [is] possible to accelerate the volumetric determination of radi[o]genic argon by means of an apparatus involving the pri[n]ciple of internal heating. S. I. T.

[Vistelius (A. B.)] Вистелиус (А. Б.). К вопросу о проис[х]хождении красноцветной толщи п-о Челекен. Опы[т] использования абсолютного возраста обломочны[х] минералов для решения задач литологии и палеогео[г]графии. [*On the origin of the red beds of the Chelek[en] peninsula. An attempt to use the absolute age of clast[ic] minerals for solving problems of lithology and palae[o]geography.*] Доклады Акад. Наук СССР. [C.R. Aca[d.] Sci. U.S.S.R.], 1959, **125**, 1307–1310, 1 fig.

The absolute age of micas, extracted from various roc[ks] and determined by the argon method, provides a clue [to] their derivation and origin. S. I. T.

[Amirkhanov (Kh. I.), Brandt (S. D.), & Bartnitzk[aya] (E. N.)] Амирханов (Х. И.), Брандт (С. Д.) и Бартницкая (Е. Н.). Диффузия радиогенного аргона в полевых шпатах. [*The diffusion of radiogenic argon in feld[spars.*] Доклады Акад. Наук СССР. [C.R. Acad. Sc[i.] U.S.S.R.], 1959, **125**, 1345–1347, 4 figs.

Formulae and numerical results for losses of radiogen[ic] argon from two samples of feldspar of Precambrian age a[re] given. S. I. T.

[Amirkhanov (Kh. I.), Brandt (S. D.), & Bartnitzk[aya] (E. N.)] Амирханов (Х. И.), Брандт (С. Д.), и Бартницкая (Е. Н.). К определению абсолютного возраста калиевых полевых шпатов аргоновым методом. [*Absolute a[ge] determination of potash feldspars by argon content.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Sér. Géol.], 1958, **11**, 110–112, 1 fig.

The total removal of ^{40}A and ^{40}K from the ' unstable ' zone and their determination in the ' stable ' zone, may lea[d] to a correct age determination of feldspars, The accou[nt] of experiments is given. S. I. T.

[Semenenko (N. P.)] Семененко (Н. П.). Геохронологи[я] докембрия в абсолютном летоисчислении. [*Geochron[o]logy of Precambrian in absolute chronology.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Sér. Géol.], 1959, **5**, 3–15.

The latest data are given for the absolute age of th[e]

Precambrian formations of the Ukraine, Baltic shield, Aldan Sayan-Baikal, and other U.S.S.R. complexes. The data are compared with those for other world occurrences and ten cycles of orogenesis and mineralization, ranging from 500 to 3500 m.y., are outlined. These cycles are then grouped into four planetary megacycles, while the three Postcambrian orogenic cycles are grouped into a fifth megacycle. A correlation of the nomenclature of cycles and megacycles on a world-wide scale is attempted. Nomenclature of the Precambrian megacycles is proposed as follows : I, Catarchaean ; II, Archaean (1900–2650 m.y.) ; III, Proterozoic (1200–1850 m.y.) ; IV, Rhiphaean (500–1150 m.y.). S. I. T.

[Smolin (P. P.)] Смолин (П. П.). Слюдоносные пегматиты и абсолютный возраст послеюрских интрузий Алдана. [*Micaceous pegmatites and absolute age of post-Jurassic intrusions of Aldan.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1959, **1**, 45–49, 2 figs.

Age determinations of biotite, orthoclase, and anorthoclase from pegmatites and alkaline syenites of the Central Aldan region by the K–A methods, gave a range of 107–135 m.y., suggesting intrusion during the Upper Jurassic.

S. I. T.

[Tugarinov (A. I.)] Тугаринов (А. И.). О многоэтапности формирования рудных залежей. [*On the successive stages of formation of ore deposits.*] Вопросы геохимии и минералогии, Акад. Наук СССР. [Problems of Geochemistry and Mineralogy, Acad. Sci. U.S.S.R.], 1956, pp. 94–108, 2 figs.

Basing his discussion on examples of Canadian, South African, and Russian uranium and lead ores, the author considers the applicability of the lead isotopes and uranium methods of age determination to the elucidation of successive stages of ore formation. S. I. T.

Koczy (F. F.), Picciotto (E.), Poulaert (G.), & Wilgain (S.). *Mesure des isotopes du thorium dans l'eau de mer.* Geochim. Cosmochim. Acta, 1957, **11**, 103–129, 2 figs.

A method is described for determining Th isotopes using $Fe(OH)_3$ precipitated at pH2 as a carrier and ^{234}Th as a β source tracer. Results are given for 8 Swedish coastal waters with salinities varying between about 23‰ and 35‰. Average concentrations were found to be $^{227}Th < 7\times10^{-23}$ g/ml, ^{228}Th $4{\cdot}0\pm1{\cdot}4\times10^{-21}$ g/ml, ^{230}Th 6×10^{-16} g/ml, and ^{232}Th 2×10^{-11} g/ml. Concentrations of U and Ra are taken to be $1{\cdot}5\times10^{-9}$ and 8×10^{-17} g/ml respectively. It is concluded that ^{230}Th (ionium resulting from ^{238}U decay) is so low in coastal waters that precipitation of ionium in sediments is proved. Further, actinium or protoactinium are probably coprecipitated with ionium in sediments.

J. R. B.

Masuda (Akimasa). *Isotopic composition of primeval lead of the earth.* Geochim. Cosmochim. Acta, 1958, **13**, 143–152, 2 figs.

It is supposed that at primeval time the isotopic content of Pb was homogeneous throughout the earth. Subsequently differentiation caused Pb, U, and Th to be distributed in different relative proportions in different parts of the earth's crust. Lead in ore is assumed to be a residual of silicate magma with the same isotopic composition as lead in the parent silicate. Using these assumptions and the usual radioactive decay relationships, it is suggested that the primeval age of the earth is between about 4×10^9 and 5×10^9 years. This compares with modern estimates for the age of stone meteorites. J. R. B.

Fergusson (G. J.). *Reduction of atmospheric radiocarbon concentration by fossil fuel carbon dioxide and the mean life of carbon dioxide in the atmosphere.* Proc. Roy. Soc. London, 1958, **243**, **A**, 561–574, 2 figs.

The ^{14}C specific activity of atmospheric carbon dioxide has decreased by $2{\cdot}03\pm0{\cdot}15\%$ between 1860 and 1954 due to the addition of radiocarbon-free carbon dioxide, amounting to 13% of the total carbon dioxide content of the atmosphere, derived from the combustion of fossil fuels. The decrease is inferred from measurements of the ^{14}C concentration in tree-ring samples of 20 years span and known age. Consideration of the carbon cycle in terms of various mathematical models indicates that the mean life of a carbon dioxide molecule in the atmosphere is $\approx$2 years.

D. McK.

APPARATUS AND TECHNIQUES

Spectrophotometric, colorimetric

Underwood (A. L.). *Spectrophotometric determination of iron with ethylenediamine di(o-hydroxyphenylacetic acid).* Anal. Chem., 1958, **30**, 44–47.

The ferric complex of this reagent is stable over a wide pH range, and the colour is stable over long periods. At the optimum concentration of approx. 5 p.p.m. Fe the standard deviation is approx. 0·5%. [M.A. **13**–258, 436] R. A. H.

Davis (N. F.), Osborne (C. E., *Jr.*), & Nash (H. A.). *pH Adjustment in colorimetric iron determinations.* Anal. Chem., 1958, **30**, 2035.

With the 2,2′-bipyridine and the *o*-phenanthroline methods for determination of Fe the colour-forming agent should be added before the pH is adjusted, to avoid low results. R. A. H.

Buchanan (E. B., *Jr.*) & Wagner (Walter). *Spectrophotometric determination of iron with 2-fluorobenzoic acid.* Anal. Chem., 1957, **29**, 754–756.

Ferric iron is determined in solution at pH 3·0 to 3·5 using an absorbance maximum at 525 mμ. R. A. H.

Gottfried (J.). [*Analytical methods for the determination of titanium and iron in titaniferous clays.* Chem. Průmysl, 1958, **8**, 176–180.] Anal. Abstr., 1959, **6**, abstr. 1251.

Colorimetric methods with chromotropic acid, or with H_2O_2, and a potentiometric method are described. R. A. H.

Pollock (J. B.). *A photometric method for the determination of tungsten in low-grade mine ore and mineral-dressing products.* Analyst, 1958, **83**, 516–522.

Following the removal of silica with HF, the sample is fused with Na_2CO_3, the resultant melt extracted with water, an appropriate aliquot acidified to pH 1·65, rhodamine B solution added and the optical density measured at 6000Å. Al may interfere, but sodium aluminate can be added to the standard solutions in an equivalent amount. Four chemical analyses are given for low-grade Uganda tungsten ores which have SiO_2 70·65–83·50%, and WO_3 0·22–0·30%. R. A. H.

Hope (R. P.). *Colorimetric determination of tungsten in scheelite ores and mill products.* Proc. Australian Inst. Mining & Metall., 1958, 51–64.

After fusion with NaOH and treatment with H_2SO_4 and $4M SnCl_2$ in HCl, NH_4SCN is added and the colour determined at 400 mμ. [M.A. **14**–5] R. A. H.

Powell (W. A.) & Poindexter (E. H.). *Carminic acid method for spectrophotometric determination of boron.* U.S. Atomic Energy Comm., 1957, Rept. CCC–1024–TR–226, 26 pp.

—— —— 1:1′-*Dianthrimide method for spectrophotometric determination of boron.* Ibid., Rept. CCC–1024–TR–229, 28 pp.

—— , Hardcastle (E.), & Poindexter (E. H.). *Curcumin (turmeric) method for spectrophotometric determination of boron.* Ibid., Rept. CCC–1024–TR–230.

The curcumin method is four times as sensitive as the 1-1′-dianthrimide method which is itself three times more sensitive than the carminic acid method for the determination of up to 30–40 μg of boron. All the methods are relatively simple and their reproducibility is good. [M.A. **13**–259] R. A. H.

Štefl (M.). [*The decomposition of minerals with aluminium sodium hydroxide. Determination of boron in silicat*] Chem. Listy, 1958, **52**, 342–343]. Anal. Abstr., 19[5] **5**, abstr. 3645.

Tourmaline may be decomposed by heating with po[wdered Al and dry powdered NaOH. After distillation wi[th methyl alcohol into K_2CO_3 solution, the distillate is evapor[ated to dryness, ignited, dissolved in water, and B determin[ed spectrophotometrically at 585 mμ using carmine. [M.A. **13**–76, 259] R. A. H.

Pitulescu (G.). [*Colorimetric determination of small quantities of boron with carmine.* Rev. Chim., Bucharest 1958, **9**, 318–319.] Anal. Abstr., 1959, **6**, abstr. 1217.

A method claimed to be suitable for rocks and minera involves the treatment of the sample with Ca saccharat solution, followed by heating at 900°C and treatment wi H_2SO_4 and carmine solution. R. A. H.

Kuemmel (Donald F.) & Mellon (M. G.). *Ultraviol absorptiometric determination of boron in aqueo medium using chromotropic acid.* Anal. Chem., 1957, 2 378–382.

Absorbancy of chromotropic acid at 361·5 mμ is decrease by the addition of boric acid. B may be determined in t range 0·1 to 2·4 p.p.m. in solutions adjusted to have a p of approximately 7. [M.A. **13**–76] R. A. H.

Walcha (Z.). [*Determination of minute amounts of boron silicate materials.* Sklář a Keramik, 1958, **8**, 113 Anal. Abstr., 1959, **6**, abstr. 486.

Details are given for the fusion of the sample with alka carbonate, followed by separation of SiO_2 with ammoni and the colorimetric determination of B with quinalizari R. A. H.

Nietzel (Oscar A.) & De Sesa (Michael A.). *Spectr photometric determination of uranium with thiocyana in butyl cellulose–methyl isobutyl–water medium.* Ana Chem., 1957, **29**, 756–759. R. A. H.

Seim (H. J.), Morris (R. J.), & Frew (D. W.). *Rapi routine method for determination of uranium in ore* Anal. Chem., 1957, **29**, 443–446.

The separation of U from all commonly occurring inter fering ions is effected by adsorption on an ion exchang resin, and after elution, U is determined colorimetrically b the NaOH–H_2O_2 method. As little as 0·01% U_3O_8 can b determined with a precision of ±0·005%. [M.A. **13**–258 440, 510, 576, **14**–11] R. A. H.

ICHAL (J.), PAVLÍKOVÁ (E.), & ZÝKA (J.). *Die Verwendung von Merkupral für die photometrische Bestimmung von kleinen Quecksilbermengen in Erzen.* Zeits. anal. Chem., 1958, **159**, 321–327.

The diminution in the intensity of a yellow-brown complex f copper brought about by its reaction with Hg and Ag to rm a stable colourless complex is the basis of an indirect hotometric determination of Hg in ores. R. A. H.

LARK (L. J.). *Cobalt determination in soils and rocks with 2-nitroso-1-naphthol.* Anal. Chem., 1958, **30**, 1153–1156.

The red complex formed between Co and 2-nitroso-1-aphthol is specifically extractable with isoamylacetate. o preliminary separation of interfering metals is required. pectrophotometric measurements at 530 mμ permit the etermination of 0·1 μg Co in 10 ml of solution. [M.A. **13**–36, 439, 512] R. A. H.

OTÔ (H.), KAKITA (Y.), & NAMIKI (M.). *A new spectrophotometric determination of titanium with sodium alizarinsulfonate.* Sci. Rept. Res. Inst. Tôhoku Univ. Japan, ser. A, 1957, **9**, 245–252.

Alizarinsulfonate and stannous chloride are reduced by i in HCl, turning the solution green : the absorbance is easured at 760 mμ. The method is very sensitive and most f the common metallic ions do not interfere. R. A. H.

RA (MITSURU). *Colorimetric determination of germanium in coal by a wet-decomposition method. I. Conditions of analysis.* [Journ. Chem. Soc. Japan, Pure Chem. Sect., 1957, **78**, 316–320.] Anal. Abstr., 1957, **4**, abstr. 3893.] R. A. H.

OOD (G. A.) & STANTON (R. E.). *A rapid method for the determination of chromium in soils for use in geochemical prospecting.* Trans. Inst. Mining & Metall., London, 1957, **66**, 331–340.

Procedures are described for the colorimetric determination of Cr as sodium chromate and as the dichromate-iphenylcarbazide complex. These two procedures have een found satisfactory for the determination of Cr in soils y visual comparison with an accuracy of ±25%, within ie range of 5 to 30,000 p.p.m. Cr. R. A. H.

VEREST (D. A.) & MARTIN (J. V.). *The determination of thorium in ores by liquid-liquid extraction.* Analyst, 1959, **84**, 312–317.

Th is separated from gross amounts of other elements by xtraction from nitric acid to which aluminium nitrate has een added with isobutyl methyl ketone containing 10% i-*n*-butyl phosphate. Th is then extracted from the organic phase with water and determined absorptiometrically with 1-(*o*-arsonophenylazo)-2-napthol-3 : 6-disulphonic acid (APANS). [M.A. **13**–437, **14**–12] R. A. H.

ECKERT (G.). *Bestimmung von Mikrogrammengen Silicium als Silicomolybdänblau.* Zeits. anal. Chem., 1958, **161**, 421–432, 6 figs.

Conditions for the determination of Si by reduction of molybdosilicic acid to molybdosilicon blue have been studied. The extinction at 730 mμ is less dependent on pH than at the maximum absorption at 800 mμ. The reproducibility of the recommended method is better than ±2%. R. A. H.

DUNSTONE (J. R.) & PAYNE (E.). *A simple spectrophotometric method for determining magnesium, calcium, strontium, barium, cadmium and zinc with ethylenediaminetetra-acetic acid.* Analyst, 1959, **84**, 110–113, 1 fig.

A method is described for the rapid analysis of many samples when an accuracy of ±3% is sufficient. R. A. H.

MUSTAFIN (I. S.) & MATVEEV (L. O.). [*Analytical use of phenolcarboxylic acids of the triphenylmethane series. Determination of beryllium in minerals and alloys.* Zavod. Lab., 1958, **24**, 259–262.] Anal. Abstr., 1959, **6**, abstr. 47.

The use of Solochrome brilliant blue B (here called alberon) for the absorptiometric determination of Be, is discussed. Two procedures are described for the determination of Be in beryl. R. A. H.

Spectrographic

LOUNAMAA (K.). *Chemical concentration and spectrographic determination of some trace elements in silicate rocks.* Suomen Kem., b, 1957, **30**, 232–240.

The rock is dissolved in HF and the trace elements Ag, Bi, Cd, Ca, Cu, Ni, Pb, and Zn are extracted from a solution at pH 9 with dithizone. The metals are transferred to a $MgSO_4$ matrix and determined spectrographically by interrupted arc excitation with Cr and In as internal standards. R. A. H.

CYPRÈS (R.) & WOLLAST (R.). [*Spectrographic determination of lithium in its minerals.* Bull. Soc. Chim. Belgique, 1958, **67**, 171–184.] Anal. Abstr., 1959, **6**, abstr. 830.

From 0·2 to 10% Li in spodumene, petalite, lepidolite, or amblygonite can be determined by fusing the sample with Na_2CO_3 at 800°–1000°C which gives a solid solution of Li_2O in nepheline. The melt is then arced and Li determined by the ratio of the lines Li 3232Å : Ag 3194Å. R. A. H.

Innes (D. D.). *Spectrographic analysis of some minor constituents in refractories.* Trans. Brit. Ceram. Soc., 1958, **57**, 29–37, 2 figs.

A method is described for the determination of K_2O, Na_2O, Fe_2O_3, TiO_2, CaO, MgO, ZrO_2, and possibly Al_2O_3. The ground sample is mixed with carbon powder and $SrCl_2$ for the determination of the last six oxides, and Co is introduced as oxide for an internal standard. For the determination of the alkali metals the sample is mixed with carbon powder and Rb introduced as $RbCl_2$ for an internal standard. Cathode excitation is used and intensity ratios determined by the method of line separation at constant blackening value. Standard deviations are given [from which the following approximate relative deviations can be calculated TiO_2 5%, Fe_2O_3 3–6%, Al_2O_3 3%, MgO 10%, CaO 4–10%, ZrO_2 15%, K_2O 2½–5%, Na_2O 10–30%]. G. D. N.

Kul'skaya (O. A.) & Vdovenko (O. F.). [*Spectrographic method for the quantitative determination of scandium in natural materials and coal ash.* Ukr. Khim. Zhur., 1957, **23**, 799–804.] Anal. Abstr., 1959, **6**, abstr. 85.

Zr is used as internal standard following concentration of Sc by precipitation with Th, Zr, La, or a rare earth. The line pairs Sc 2552·3–Zr 2550·7 and Sc 3353·7–Zr 3357·2 are used. [M A. **14**–9] R. A. H.

Hamaguchi (H.), Tomura (K.), & Kuroda (R.). *Quantitative spectrographic analysis of scandium in silicate minerals.* Journ. Chem. Soc. Japan, Pure Chem. Sect., 1958, **79**, 504–507.

A linear working curve was obtained for 5 to 1000 p.p.m. of Sc using Pt (3204·04Å) as internal standard, with Sc 3613·84Å and 5 times the sample weight of carbon; the error is <5%. R. A. H.

Scott (R. O.) & Ure (A. M.). *The determination of magnesium in solution by direct photometry.* Analyst, 1958, **83**, 561–570, 2 figs., 2 pls.

Mg in soil extracts has been determined by the porous-cup–spark method with the aid of a direct-reading photometric attachment fitted to a quartz spectrograph. The Mg line at 2802Å is used with the Sr line at 4077Å as internal standard, and solutions containing 0·3 to 24 p.p.m. Mg are analysed directly with a coefficient of variation of approx. ±2% at a rate of 40 determinations/hour. R. A. H.

Hamaguchi (Hiroshi) & Kuroda (Rokuro). [*Determination of traces of silver in silicate rocks.* Journ. Chem. Soc. Japan, Pure Chem. Sect., 1957, **78**, 1668–1671.] Anal. Abstr., 1958, **5**, abstr. 2893.

Ag in silicate rocks (0·03 to 0·7 μg/per g) is collected by co-precipitation with Te and determined spectrographically with In as internal standard. R. A. H.

Rockenbauer (W.) & Brandenstein (M.). *Eine Methode zur spektrographischen Bestimmung von Selen.* Zeits. anal. Chem., 1958, **160**, 104–108, 2 figs.

The concentration of Se (0·0001% to 0·1%) in sulphide ores can be determined within ±15% by a comparison of the Se lines 2039·85, 2062·79Å, and 2074·79Å with the Cu line 2170·48Å. [M.A. **13**–434] R. A. H.

Borodin (L. S.). [*Quantitative spectroscopic determination of niobium in titanium and zirconium minerals.* Trudy Inst. Min., Geokhim. i Kristallochim. Redk. Elementov Akad. Nauk S.S.S.R., 1957, 182–187.] Anal. Abstr., 1959, **6**, abstr. 130.

Relatively large amounts (0·1 to 5%) of Nb are determined in minerals by means of a d.c. arc, using the lines 2671·9 and 2716·6Å; the error is about ±10%. R. A. H.

Puzanova (K. P.). [*Spectrographic analysis of nickel in quartz, pyrites and chalcopyrites.* Trudy Sverdl. Gorn. Inst., 1957, 68–75.] Anal. Abstr., 1958, **5**, abstr. 413.

An investigation into the effect of the matrix on various Ni lines showed that their intensity depends very little on the type of molecule containing Ni. R. A. H.

Grabowski (R. J.) & Unice (R. C.). *Quantitative spectrochemical determination of barium and strontium.* Anal. Chem., 1958, **30**, 1374–1379, 6 figs.

After sodium carbonate fusion of the rock or mineral and solution in HCl, indium oxide is added as an internal standard, and Sr and Ba are determined by an emission spectrographic method using high voltage spark excitation. Coefficients of variation of <5% are indicated. [M.A. **14**–7, 8] R. A. H.

Hahn-Weinheimer (P.). *Zur Bestimmung von Edelmetallspuren in Gesteinen.* Zeits. anal. Chem., 1958, **162**, 161–167, 1 fig.

A method is described for the determination of noble metals in rocks which involves the reduction of an extract with hydroxylamine hydrochloride, the addition of quinoline-2-selenol (a sensitive reagent for the noble metals whose preparation is described), extraction with $CHCl_3$, evaporation to dryness, and the spectrographic determination of Os (sensitivity 2 μg), Ir, Ru, and Rh (0·05 μg), and Pt and Pd (0·01 μg). R. A. H.

AMAGUCHI (H.) & TOMURA (K.). [*Spectrographic determination of gallium in silicate rocks.* Japan Analyst, 1958, **7**, 105–106.] Anal. Abstr., 1958, **5**, abstr. 3650.

R. A. H.

RONSHTEĬN (A. N.). [*Spectrographic determination of gallium, indium and thallium in lead-zinc ores and their industrial by-products.* Sb. Nauk. Trud. Gos. Nauk.-Issled. Inst. Tsvetn. Met., 1958, 51–57.] Anal. Abstr., 1959, **6**, abstr. 870.

Spectrographic analyses make use of the lines Ga 4172·06, n 4101·7, and Tl 3775·7Å, with the mixture of a sample and ZnS standard base in the ratio 1 : 5. K 4044·1 is used as the internal standard ; the presence of Fe causes interference between Fe 4172·13 and Ga 4172·06Å. The average error is ±7%. R. A. H.

REED (ALBERT C.). *Spectrographic analysis for vanadium in Kansas Clays.* Bull. Kansas Geol. Survey, 1950, **86**, pt. 2, 21–40, 2 figs.

Minute quantities of soluble vanadium compounds in structural clay products made from some high-quality Kansas clays cause green or yellow discoloration. Colorimetric methods are inadequate for determination of very small amounts of vanadium. A quantitative spectrographic method of analysis is described, using synthetic standards and analytic calculations. (Four chem. anal., 13 spectrographic anal. for vanadium.) A. Sw.

X-ray spectrometric, various

HEIDEL (R. H.) & FASSEL (V. A.). *X-ray fluorescent spectrometric determination of yttrium in rare earth mixtures.* Anal. Chem., 1958, **30**, 176–179.

For the determination of Y in ores a preliminary rare earth group separation is required : the samples are then analysed in solution. There is good agreement with spectrographic results. R. A. H.

BARIEAU (ROBERT E.). *X-ray absorption edge spectrometry as an analytical tool. Determination of molybdenum and zinc.* Anal. Chem., 1957, **29**, 348–352. R. A. H.

CAMPBELL (W. J.) & THATCHER (J. W.). *Determination of calcium in wolframite concentrates by fluorescent X-ray spectrography.* U.S. Bur. Mines, 1958, Rept. Invest. **5416**, 18 pp.

X-ray spectrographic analysis is accurate to ±5% for Ca concentrations >0·3%, ±10% around 0·1% Ca, and has a sensitivity of 0·005 to 0·01%. R. A. H.

BARINSKIĬ (R. L.). [*Determination of rare-earth elements in minerals and concentrates by X-ray fluorescence analysis.* Zavod. Lab., 1958, **24**, 613–617.] Anal. Abstr., 1959, **6**, abstr. 1238.

Details are given for the determination of La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu in the range 0·1 to 100% using 10 to 20 mg samples. The highest accuracy (2 to 5%) is attained with concentrations of <1 to 3%. R. A. H.

NARBUTT (K. I.) & BESPALOVA (I. D.). [*X-ray fluorescence analysis of ores and minerals for uranium, thorium, lead, tantalum, hafnium, niobium, zirconium, yttrium and strontium.* Zavod. Lab., 1958, **24**, 617–619.] Anal. Abstr., 1959, **6**, abstr. 947.

A universal focussing X-ray spectrometer and a special method of weighing and preparing the sample are used.

R. A. H.

GRAY (P. M. J.). *The extraction of uranium from a pyritic ore by acid pressure leaching.* Trans. Inst. Mining & Metall., London, 1956, **65**, 55–64, 5 figs.

Sulphuric acid generated by pressure digestion of pyrite or pyrrhotite by compressed air or oxygen in water at up to 200°C is utilized to leach uranium from co-existing uranium minerals. For an ore with disseminated uraninite 95% or more of the U and up to 89% of the Cu can be leached without using any reagents other than water and compressed air. R. A. H.

JEDWAB (J.). *Adaptation of paper chromatography to geochemical prospecting for uranium deposits of the Katanga type.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 178–181.

The method of Hunt, North, and Wells [M.A. **13**–75] is applied to the analysis of U, Co, Cu, and Ni. Extraction with nitric acid permits the four elements to be determined from one solution. Starting with the digest solutions, a qualified operator can analyse 150–200 samples per day.

J. D. P.

SMITH (G. H.) & CHANDLER (T. R. D.). *A field method for the determination of uranium in natural waters.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 148–152, 1 table.

EDTA is added to the clarified and acidified sample to complex interfering metals. After addition of a solution of dibenzoylmethane in ethanol the pH is brought to 5·7 with a pyridine buffer, and the yellow uranium-dibenzoylmethane complex extracted into a carbon tetrachloride layer for visual comparison with standards. The detection limit is

1 μg/litre uranium. Results are given of tests in Cornwall and elsewhere, and modifications suggested for analysing polluted waters. J. D. P.

Korkisch (J.), Farag (A.), & Hecht (F.). *Eine neue Methode zur Bestimmung des Urans in Phosphaten, Kohlenaschen, Bauxiten usw. mittels Ionenaustausches.* Zeits. anal. Chem., 1958, **161**, 92–100, 3 figs.

A column of strongly basic ion-exchange resin is used to retain U from 4*N* HCl containing ascorbic acid ; U is then eluted and determined by polarography or U.V.-fluorescence. This procedure has been applied to silicate rocks, phosphates, coal ash, and bauxites. R. A. H.

Zheleznova (E. I.) & Tokareva (D. V.). [*Use of the radiometric method for determining uranium, thorium and radium in ores.* Zavod. Lab., 1958, **24**, 959–963.] Anal. Abstr., 1959, **6**, abstr. 1722.

Measurements of total γ-ray intensity, the harder γ-ray intensity (> 1·8 MeV for Th), intensity of accumulated Ra emanation, and Al-filtered β-ray intensity (for U) are made, and the contents of U, Th, and Ra are calculated.

R. A. H.

Elbeih (I. I. M.) & Abou-Elnaga (M. A.). *A new method—based on paper chromatography—for the estimation of thorium and uranium in monazite.* Anal. Chim. Acta, 1958, **19**, 123–128, 3 figs.

A dioxan-antipyrine solvent mixture is used to separate Th and U on sheet chromatograms, following decomposition of the monazite with H_2SO_4. Th is estimated by an indirect EDTA titration using pyrocatechol violet, and U is estimated spectrophotometrically by the H_2O_2 method. [M.A. **13**–437] R. A. H.

Prosperi (D.) & Sciuti (S.). [*Radiometric methods for the determination of uranium and thorium in minerals.* Ric. Sci., 1958, **28**, 345–361.] Anal. Abstr., 1958, **5**, abstr. 4097.

Existing methods are reviewed and a procedure is proposed using a γ–γ–β method which involves simultaneous measurement of β-activity and of γ-activity at two different energy levels. [M.A. **13**–509, 576] R. A. H.

Suñer (Antonio A.). *Determination of thorium in low-grade ores.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **3**, 580–588, 6 figs., 5 tables.

Amounts of thorium up to 0·01% were determined in mixtures with the lanthanides and the other tetravalent elements. M. J. G.

Hilal (O.), Saleh (F.), & Kiwan (A.). *The separation of thorium and the rare earth group from moderate monazite concentrates. Part I.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **3**, 575–579, 2 figs., 2 tables.

A method of recovering thorium and cerium-earth elements from monazite sand concentrates is described. The method is practically unaffected by the amounts of mineral impurities present (including zircon and rutile).

M. J. G.

Collée (R.), Govaerts (J.), & Winand (L.). *Quantitative analysis of thorium in ores and thoriferous products, by a method based on radioactivity.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **3**, 589–594, 6 figs., 1 table.

Conventional methods of thorium analysis are discussed and a fast radiochemical technique described. Using a gamma spectrometer, samples containing 0·8%–21% ThO_2 were successfully analysed. M. J. G.

Oehme (F.). [*Analysis of rutile-anatase mixtures by measurement of dielectric constants.* Farbe u. Lack, 1958, **64**, 319–321.] Anal. Abstr., 1959, **6**, abstr. 1341.

R. A. H.

Pinchuk (N. Kh.) & Morashevskii (Yu. V.). [*Phase analysis of iron ores. III. Selective dissolution of magnetite in the presence of haematite.* Vestn. Leningrad. Univ., 1958, 125–133.] Anal. Abstr., 1959, **6**, abstr. 1328. R. A. H.

Newman (A. C. D.). *The separation of fluoride ions from interfering anions and cations by anion exchange chromatography.* Anal. Chim. Acta, 1958, **19**, 471–476.

Fluoride may be separated from phosphate and the anionic metal chelates of EDTA by absorption on, and elution from, an anion exchange column containing a strongly basic resin. This provides a simple and accurate method of removing interfering ions prior to the determination of F by thorium nitrate titration, and is a satisfactory alternative to the Willard & Winter distillation. A procedure is described for the determination of F in rock phosphates. [M.A. **13**–324, 325, 574] R. A. H.

Neumann (Henrich). *A pulverizer for micas and micaceous minerals.* Norsk Geol. Tidsskr., 1956, **36**, 52–54, 2 figs.

A description and detailed drawing are given for a pulverizer in which mica particles floating in air are hit by sharp knife edges which split them without causing any structural distortions. R. A. H.

ISHIKAWA (YASUHARU). *Fluorimetric analysis. VII. Determination of gallium in silicate rocks with 8-hydroxyquinaldine.* Journ. Chem. Soc. Japan, Pure Chem. Sect., 1958, **79**, 236–238.

Ga is extracted with ether from 6*N* HCl to avoid interference from Cu, V, Mo, and Al. R. A. H.

UTTERS (B.) & CHENERY (E. M.). *A rapid method for the determination of total sulphur in soils and plants.* Analyst, 1959, **84**, 239–245.

The turbidimetric measurement of sulphate as barium sulphate is described, extremely pure $Mg(NO_3)_2$ being used to oxidize the organic matter. R. A. H.

RICE (ROBERT V.) & COHEN (ALVIN J.). *A new method for orienting electron microscope replicas applied to twinned quartz.* Amer. Min., 1958, **43**, 25–33, 6 figs.

The technique allows successive examination of specific areas of relatively rough surfaces by optical and then electron microscopy. A. P.

[DANCHEV (V. I.)] Данчев (В. И.). Значение количественного определения цвета проод при изучении осадочных месторождений урановых руд. [*Significance of a quantitative determination of rock colour in studying sedimentary deposits of uranium ores.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1958, **11**, 71–83, 10 figs.

This is a review of work done in the U.S.S.R. and U.S.A. on the photometric determination of the colour of limestones and sandstones and its relation to the contents of organic carbon, iron oxides, and uranium. S. I. T.

PRYOR (E. J.) & LOWE (G. M.). *Changes in copper solubility during flotation of malachite.* Trans. Inst. Mining & Metall., London, 1956, **65**, 469–486.

Varying behaviour of malachite during flotation with potassium ethyl xanthate is shown to be related to the varying solubility of the mineral. The solubility of malachite is not controlled by the pH of the solution but is related to the ratio between the concentration of carbonate and hydroxyl ions. A method of analysis for Cu capable of estimating fractions of a milligram per litre has been developed. R. A. H.

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—— *Data of rock analyses—II. Bibliography and index of rock analyses in the African periodical and serial literature.* Ibid., 190–213. J. R. B.

WEST (T. S.) & SYKES (A. S.). *Analytical applications of diaminoethane-tetra-acetic acid [EDTA].* Poole, England (British Drug Houses, Ltd.), 1959, 106 pp. Price 4*s*. 6*d*.

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VINOGRADOV (A. P.). *The geochemistry of rare and widely scattered chemical elements in soils.* 2nd ed. New York (Consultants Bureau), 1959, 209 pp. Price $9.50 (80*s*.)

Symposium on spectrochemical analysis for trace elements. Papers presented at the sixtieth Annual Meeting of the American Society for Testing Materials, Atlantic City, N.J., June 18th, 1957. Philadelphia (A.S.T.M.), 1958, vi + 79 pp. Price $2.75.

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SHUBNIKOVA (A. V.) & SHEFTAL (N. N.).—Editors. *Growth of crystals.* Translated from the Russian. New York (Consultants Bureau), 1959, 294 pp. Price 120*s*.

SARATOVKIN (D. D.). *Dendritic crystallization.* 2nd ed., translated from the Russian. New York (Consultants Bureau), London (Chapman and Hall), 1959, 126 pp., 88 figs., 6 tables. Price $6.00 (£2 10*s*.).

DEICHA (D.). *Les lacunes des cristaux et leurs inclusions fluides.* Paris (Masson et Cie), 1955, 136 pp., 13 figs., 12 pls. Price Fr. 1200.

Buerger (M. J.). *Vector space and its application in crystal structure investigation.* New York (Wiley), 1959, 347 pp. Price $12.00 (96*s.*).

Searle (A. B.) & Grimshaw (R. W.). *The chemistry and physics of clays and other ceramic materials.* 3rd ed. London (Ernest Benn), 942 pp. Price £6 6*s.*

R. A. H.

[Lazarenko (E. K.)] Лазаренко (Є. К.). Курс минералогії. Частина I, Загальна минералогія. [*A text-book of mineralogy. Part I. General mineralogy.*] Вид. Львів. Унів. [Publ. Lvov Univ.], 1958, 286 pp., 18 portraits + 220 figs. Price 6 r. 80 k.

This text-book of mineralogy, published in the Ukrainian language, consists of three parts, of which only the first is published as yet. The other two parts will consist of a descriptive mineralogy and the mineralogy of rocks. It is a very nicely written, balanced, and up to date text-book, specially designed to serve university students. After a brief introduction there follows a chapter (pp. 8–31) giving a concise history of mineralogy, illustrated by 18 portraits of mineralogists, ranging from Ibn Sina (Avicena) (980–1037) to M. D. Sidorenko (1859–1925). In the next chapter (pp. 32–89) the following subjects relating to the constitution of minerals are discussed : chemical composition and crystalline structure, isomorphism and polymorphism, colloidal and metamict minerals, and radioactivity. Then follow chapters dealing with crystal and crystalline aggregate morphology (pp. 90–132), physical properties of minerals (pp. 91–174), processes of formation and occurrence of minerals in nature (pp. 175–253), and finally a chapter on methods of mineralogical study (pp. 254–274), and a subject index (pp. 275–283). The illustrations are numerous and well selected, with the line drawings well reproduced but the photographic illustrations not so well reproduced. The book is of a handy size, well bound and sold at a very low price.

S. I. T.

[Mikheev (V. I.)] Михеев (В. И.). Рентгенометрический опедрелитель минералов. [*X-ray determinative tables for minerals.*] Госгеолтехиздат. [Gosgeoltekhizdat], Moscow, 1957, 869 pp. Price 40 r. 75 k.

This book contains X-ray powder data tabulated for 905 minerals and includes all data published to 1950 inclusive. It comprises an introduction (pp. 1–106), a key table for determination of minerals by the five most prominent lines of the powder spectrum (pp. 107–238), a detailed description of X-ray powder patterns of minerals (pp. 239–820), bibliography (pp. 821–833), index of minerals (pp. 834–848), and a detailed table of contents which includes a full classificatory system of minerals (pp. 848–869).

S. I. T.

[Eliseev (N. A.)] Елисеев (Н. А.). Методы петрографическ исследований. [*Methods of petrographical study.*] И Лен. Унив. [Publ. Leningrad Univ.], 1956, 275 pp., figs. Paper back. Price 17 r. 25 k.

This is a manual of optical petrology providing an am and detailed account of the methods developed in Russ Following the Introduction (pp. 4–7) the chapters are follows: I, Study of minerals under the microscope (pp. 8–1 II, Study of minerals in convergent polarised light (pp. 15–4 III, Theodolite (Universal) method of E. S. Fedorov (pp. 4 116) : IV, Twin triades (pp. 117–150) : V, Double theodol method of E. S. Fedorov (pp. 151–179): VI, Methods for ra determination of plagioclase (pp. 180–191) : VII, Determi tion of constants of minerals (pp. 192–257) : VIII, Systema procedure for the study of minerals under the microsco (pp. 258–270) : Bibliography (pp. 271–273). The book is ve clearly written and is provided with numerous diagram passages describing optical principles, apparatus, a methods of working are skilfully blended. Much attenti is devoted to the determination of feldspars, but the rece work on high and low temperature plagioclases is n included in this book.

S. I. T.

[Belyankin (D. S.)] Белянкин (Д. С.). Избранные Труд [*Selected works.*] Изд. Акад. Наук СССР. [Publ. Aca Sci. U.S.S.R.], 1956, vol. I, 844 pp. Price 45 r. 80 1958, vol. II, 843 pp. Price 46 r. 25 k. Each volu contains a large number of illustrations.

The Academician Dmitry Stepanovich Belyankin (187 1953), one of the greatest technical petrologists in Russi spent over 50 years in the study of natural and artifici minerals and rocks. In the recently published ' selecte works ' the first volume of 844 pages is devoted to artifici minerals and stone, while the second volume of 843 pag is devoted to the natural minerals and rocks. In this a stract it is possible to give only the headlines and conten of these two volumes : Vol. I. 1, Technical petrography, i problems and stages of development (16 articles, pp. 7–109) 2, The application of the data of technical and experiment petrology to natural processes (8 articles, pp. 113–168) 3, The mineralogy of artificial stone (24 articles, pp. 17 336) : 4, The petrography of different kinds of artifici stone (66 articles, dealing with refractories, silica brick refractories in glass industry, slags, cement, ceramic products of crystallization of commercial glass and ' stones in the glass, pp. 341–840). Vol. II. 1, Papers dealing wit rock-forming minerals (51 articles, on feldspars, cla minerals, cristobalite, tridymite, and others, pp. 7–346) 2, General and regional petrography (41 articles dealin with general problems of petrology, differentiation an liquation, problem of granites, alkali rocks, lavas an intrusive rocks of the Caucasus, igneous rocks of the Ural

. 351–839). The 198 articles contained in these two lumes represent a most valuable contribution to minera- gy and petrology. S. I. T.

TRAKHOV (N. M.),—Editor] Страхов (Н. М.), редактор. Методы изучения осадочных пород. [*Methods of study of sedimentary rocks.*] Гос. Науч.-Техн. Изд. [State Sci.-Techn. Publ.], Moscow, 1957, Vol. I, 457 pp., 133 figs., 24 pls. Price 33 r. 60 k. Vol. II, 526 pp., 154 figs., 15 pls. Price 32 r. 10 k.

This is a very large treatise on sedimentary rocks, written y many authors and edited by an editorial group composed f N. M. Strakhov (chief editor), G. I. Bushinsky, L. V. ustovalov, A. V. Khabakov, and I. V. Khvorova. Each hapter is illustrated by text-figures and plates and is ollowed by a bibliography containing a large number of eferences to Russian publications. Simplified, the contents f the two volumes are : Vol. I : Introduction (stages of ormation of sedimentary rocks and problems of their tudy). Part I (6 chapters) : Field observation of sedimen- ary rocks and sedimentary ores (structures, textures, olour, organic remains, concretions, facies). Part 2 : Laboratory methods of study) : Ch. I, Study of the mineral omponents and fossils in sections under the microscope ; h. 2, Study of structures and textures in sections and olished surfaces ; Ch. 3, Stadial analysis ; Ch. 4, Study of ertain physical properties ; Ch. 5, Granulometric analysis ; h. 6, Study of minerals in grains ; Ch. 7, Study of finely ivided minerals ; Ch. 9, Statistical methods. Vol. II : Part 3 (9 chapters) : Chemical study (chemical analysis f various types of rocks and elements, polarographic, spectroscopic, pH and Eh, chemical bituminological, luminescence-bituminological analyses). Part 4 (6 chapters): Particular features and requirements of the study of sedimentary rocks and sedimentary ores. Part 5 (7 chapters): Geochemical, mineralogical, palaeontological, and structural-textural criteria of environmental conditions in relation to the facial-genetic analysis of sedimentary rocks and sedimentary mineral deposits. Part 6 (4 chapters) : Stratigraphical correlation with the help of petrographical-mineralogical and geochemical indicators. S. I. T.

[TOKAREV (A. N.) & SHCHERBAKOV (A. V.)] Токарев (А. Н.) и Щербаков (А. В.). Радиогидрогеолгия. [*Radiohydrogeology.*] Госгеолтехиздат. [Gosgeoltekhizdat.], 1956, 263 pp., 53 figs. Price 12 r. 40 k.

As shown by the bibliography and references this book seems to be entirely based on Russian sources. It is a systematic theoretical and practical treatise on natural waters containing radioactive substances, and it is provided with numerous tables and diagrams. Both balneological and industrial uses of radioactive waters are discussed. In the first part (pp. 7–118) the principles of radiochemistry and radiogeochemistry are outlined, the types of water are discussed and the hydrogeological conditions of the formation and destruction of radioactive enriched rocks and solutions outlined. In the second part (pp. 121–248) methods of radiohydrogeological investigation are presented, including field survey, sampling, analysis, and evaluation of radioactive natural waters ; representation of results by special maps and diagrams is illustrated. S. I. T.

CLAY MINERALS

Properties and Structure

[YARILOVA (E. A.) & PARFENOVA (E. I.)] Ярилова (Е. А.) и Парфенова (Е. И.). Некоторые материалы к характеристике глинистых минералов коллодной фракции почв. [*Some data on the characteristics of clay minerals in the colloid fraction of soils.*] Почвоведение [Pedology], 1959, no. 2, 75–79.

Dehydration and chemical data are given for samples of polynite [M.A. **13**–580] from a range of soil types. An analysis, SiO_2 48·10, Al_2O_3 25·05, Fe_2O_3 9·80, MgO 2·25, CaO 1·61, Na_2O 0·18, K_2O 1·28, H_2O+ 9·39, =97·66 leads to the ionic formula $(Al_{1\cdot42}Fe_{0\cdot51}Mg_{0\cdot07})$ $(Al_{0\cdot64}Si_{3\cdot36})$ O_{10} $(OH)_2X_{0\cdot24}K_{0\cdot32}(H_3O)_{0\cdot22}$, allowing in both instances for SiO_2 0·67, Al_2O_3 0·98 and Fe_2O_3 0·68 extracted by Tamm's reagent. Other analyses gave similar formulae, and it is concluded that, while the composition of the octahedral layer may vary somewhat, that of the tetrahedral layer is remarkably constant. R. C. M.

WHITE (W. ARTHUR). *Water sorption properties of homoionic clay minerals.* Illinois State Geol. Survey Rept. Invest., 1958, **208**, 46 pp., 16 figs.

Water sorption properties of seven groups of clay minerals (montmorillonite, attapulgite, illite, kaolinite, halloysite, diaspore and gibbsite) were studied by means of atterberg plastic limits, slope of liquid limit line, and water sorption. The data indicate that the structure of the clay mineral is primary and that exchangeable cations are secondary in determining the water sorption and plastic properties of clay minerals and clay water systems. Sodium gave higher plastic values than did any of the other cations except lithium for the montmorillonites, whereas it gave lower values than did the other cations for the illites, kaolinites, halloysites, diaspores, and gibbsites. In addition, sodium gave the highest water-sorption values of any of the cations for the montmorillonites, whereas it gave values no higher than did the other cations for the other clay mineral

groups. The angle of slope of the liquid limit line is probably a measure of the thixotropic properties of a clay mineral. The characteristics of the water sorption curves tend to reflect the structure and properties of the clay minerals.
W. A. Wh.

Weaver (Charles E.). *The effects and geologic significance of potassium "fixation" by expandable clay minerals derived from muscovite, biotite, chlorite, and volcanic material.* Amer. Min., 1958, **43**, 839–861, 5 figs.

Samples of montmorillonite were subjected to various treatments with KOH and it is shown that there is a direct relation between the per cent of contracted 10-Å layers and the per cent of tetrahedral charge. Potassium treatment of vermiculites indicates that there are highly charged biotite and muscovite→vermiculites which readily contract to 10·0 to 10·2Å and low-charged non-mica→vermiculites which resist contraction. An examination of clays from marine sediments indicates that muscovite and biotite→vermiculite and montmorillonite are relatively rare and that most of the expanded clays are derived from low-charged non-micaceous minerals such as volcanic materials, chlorite, and hornblende.
A. P.

Roy (Rustum) & Romo (L. A.). *Weathering studies.* 1. *New data on vermiculite.* Journ. Geol., 1957, **65**, 603–610.

Vermiculite shows successive reactions on being heated under 10,000 lbs/in² water pressure. A gradual change which becomes quite marked above 300°C involves a redistribution of the mica layer Mg^{2+} and the formation of a chlorite-like phase of vermiculite composition. The first dehydration occurring at 550° leads to the formation of a mixed layer chlorite and montmorillonite. Above 650° only non-expanding structures including talc and enstatite are formed. The experiments suggest that natural vermiculite could not have formed above 300° and that it most probably formed below 200°. The relationship of vermiculite to the montmorillonoids is discussed. X-ray intensity data and d.t.a. curves for vermiculite and its hydrothermal dehydration products are presented.
H. L.

[Petrov (V. P.)] Петров (В. П.). Проблема монотермита — история исследования монотермита и его природа. [*The problem of monothermite—the history of the investigation of monothermite and its nature.*] Исследование и использование глин. Издательство Львов. Унив. [The investigation and utilization of clays. Publishing House of Lvov Univ.], 1958, pp. 84–91.

A review with 19 refs. Monothermite is stated to have characteristic chemical composition, X-ray pattern, and electron-optical and optical properties, but to have varying "degrees of monothermiteness", some samples being cl[ose] to kaolinite. Livesite [M.M. **30**–738] is an analogous mine[ral]. Monothermite is probably a montmorillonitic-kaolinite, a[nd] its position in a classification scheme of the principal c[lay] minerals is considered.
R. C. M[.]

Bose (A. K.) & Sengupta (Purnima). *X-ray and differential thermal studies of some Indian montmorillonit[es]* Nature, 1954, **174**, 40.

X-ray and differential thermal studies of bentonites fr[om] (i) Kashmir, (ii) Nimlinadi, and (iii) Barme, and of bla[ck] cotton soils from (iv) Satara and (v) Indore showed that t[he] last four constitute a subgroup intermediate betwe[en] montmorillonite and nontronite. Examination of two no[n]tronite samples from (vi) Garfield, Washington, and (v[ii] Sandy Ridge, North Carolina, showed that samples (ii) ([iii] (iv) (v) and (vi) form a more or less continuous link in t[he] montmorillonite-nontronite series.
C. H. K.

Greene-Kelly (R.). *An unusual montmorillonite compl[ex]* Clay Min. Bull., 1955, **2**, 226–232.

Montmorillonite forms with pyridine and traces of wat[er] a regular complex with a basal spacing of 23·3Å. T[he] minimum interlayer population for this complex is Na$(C_5H_5N)_4(H_2O)_2$, but much excess pyridine can be taken [up] with no increase in basal spacing. A one-dimensio[nal] Fourier synthesis shows a pronounced peak at the cent[re] of the interlayer space. The results indicate a netwo[rk] between the sheets, each Na^+ being surrounded by fo[ur] pyridine and two water molecules. Of other organic co[m]pounds tested only 2-methyl pyridine gave a spacing in t[he] same region.
R. C. M.

Franzen (P.). *X-ray analysis of an adsorption complex montmorillonite with cetyltrimethyl ammonium brom[ide] (lissolamine).* Clay Min. Bull., 1955, **2**, 223–225.

Amounts of lissolamine up to 2·4 times that equivalent [to] the c.e.c. can be sorbed by montmorillonite, this compl[ex] giving a basal spacing of 38·6Å. The excess lissolamine [is] balanced by Br^- sorbed along with the organic cation. T[he] configuration of the lissolamine in the interlayer space [is] deduced from a one-dimensional Fourier synthesis; t[he] maximum angle between the chain and the sheet surface [is] 45°.
R. C. M.

Norrish (K.) & Quirk (J. P.). *Crystalline swelling montmorillonite.* Nature, 1954, **173**, 255–257, 2 figs.

Electrolytes can be used to control the swelling of mon[t]morillonites in the range of high water content. A spaci[ng] of 40Å in sodium-montmorillonite was observed. T[he] variation of 001 spacing with electrolytic concentrati[on]

montmorillonite saturated with various cations was vestigated. Two types of swelling were observed with novalent cations, one below 22Å and one after a jump to eater than 35Å. With divalent ions only the first type curred. C. H. K.

UKOVSKY (E. G.] Куковский (Е. Г.). О минерале бейделлите. [*On the mineral beidellite.*] Исследование и использование глин. Издательство Львов. Унив. [The investigation and utilization of clays. Publishing House of Lvov Univ.], 1958, pp. 92–101.

The literature on beidellite and the criteria for its identiation are reviewed. Six samples of reputed beidellite om the Ukrainian S.S.R., on examination by chemical, ermal, X-ray, and electronoptical methods, are shown to , in the main, mechanical mixtures of different clay inerals, although one is shown to be a regularly-interratified montmorillonite-hydromica assemblage ; a onemensional Fourier synthesis for this mineral is presented. n view of its erroneous use, it is suggested that the name idellite be dropped. R. C. M.

OBERTSON (ROBERT H. S.). *Sepiolite : a versatile raw material.* Chem. & Industry, 1957, pp. 1492–1495.

Known localities for sepiolite are mentioned [M.M. **31**–28]. The paper is mainly concerned with sepiolite from allecas, Spain, the formula being similar to $H_6Mg_8Si_{12}O_{30}(OH)_{10}.6H_2O$, but with less Mg. The ionic constitution is iven, and a comparison with palygorskite drawn for cell- nd channel-size and porosity. X-ray examination has etected small amounts of palygorskite and montmorillonite n the sepiolite. An analysis by W. H. Herdsman gave SiO_2 2·76, Al_2O_3 1·46, TiO_2 0·06, Fe_2O_3 0·50, FeO 0·26, MgO 22·52, Na_2O 0·20, K_2O 0·44, H_2O+ 11·02, H_2O- 10·53, =99·75. ation exchange capacities are given. The specific gravity or material dried at 105°C is 2·17. There is a review of the pplications of sepiolite. D. C. A.

TONE (R. L.) & WEISS (E. J.). *Examination of four coarsely crystalline chlorites by X-ray and high-pressure d.t.a.* Clay Min. Bull., 1955, **2**, 214–222.

The chlorites, ranging from high-Mg to high-Fe types, were subjected to d.t.a. while steam passed through the ample at absolute pressures of from 0·001 mm Hg to 2300 nm Hg. Samples heated to temperatures corresponding to known points on the curves were examined by X-rays. The omplex changes occurring on heating are discussed. The ize of the 650°C peak is related to the Fe^{2+} content at all steam concentrations, and it is suggested that the brucite ayer breaks up in stages when exposed to 3 atm. pressure water vapour. R. C. M.

KODAMA (H.). *Mineralogical study of some pyrophyllites in Japan.* Min. Journ. [Japan], 1958, **2**, 236–244, 5 figs.

A study of greasy, compact, crystalline pyrophyllites occurring in association with dickite, kaolinite, diaspore, and corundum, in central Japan, includes chemical analyses of pale blue pyrophyllite A, pale green pyrophyllite B, bluish yellow pyrophyllite C, yellowish brown pyrophyllite D, all from Honami mine, Nagano Prefecture, and grey pyrophyllite E, from the Yoji deposit, Gumma Prefecture. Indexed X-ray powder data are given for specimens A and E : the $k=3n$ reflections are predominant, suggesting that layers randomly displaced by multiples of $\frac{1}{3}b$ are important. A thermal transformation is indicated at 700°C. A regularly interstratified pyrophyllite-montmorillonite is also recorded.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	H_2O+	H_2O-	Total
A	63·57	0·04	29·25	0·10	0·12	0·37	0·38	5·66	0·66	100·17
B	64·02	0·09	29·60	0·16	0·08	0·45	0·12	5·45	0·84	100·82
C	62·85	0·76	29·57	0·11	0·10	0·25	0·08	5·29	0·66	99·92
D	63·79	0·47	29·55	0·20	0·14	0·33	0·07	5·37	0·24	100·18
E	62·02	—	32·24	tr.	tr.	0·18	0·40		6·02	100·86

Also : A, K_2O tr., Na_2O 0·02 ; B, K_2O tr., Na_2O 0·01 ; C, K_2O tr., Na_2O tr., P_2O_5 0·25 ; D, K_2O tr., Na_2O tr., P_2O_5 0·02.

R. A. H.

BURST (J. F.). *Mineral heterogeneity in 'glauconite' pellets.* Amer. Min., 1958, **43**, 481–497, 7 figs.

Small, spherical, sometimes green earthy pellets generally called glauconite are classified into 4 groups on the basis of X-ray and chemical examination. I, Diffraction pattern like 1 M micas, K content at least 1·4 atoms per unit cell ; II, Diffraction pattern like Md micas, K content below 1·4 atoms per unit cell ; III, Interlayered clay-mineral pellets ; IV, Mineral mixtures in pellet form. A difference in morphology of the disaggregated material can be detected between the first two groups by electron microscope. A scheme of suggested diagenetic relations in micas, depending mostly on changes in K content, is shown diagrammatically. A. P.

KERR (PAUL F.) & HAMILTON (P. K.). *Chrome mica-clay, Temple Mountain, Utah.* Amer. Min., 1958, **43**, 34–47, 3 figs.

Chrome mica-clay occurs at Temple Mountain, Utah, in association with uranium mineralization. It contains approximately 0·4 to 0·6% Cr_2O_3 and consists of $2M_1$ and 1M polymorphs. At Placerville, Colorado, a similar chrome mica-clay contains as much as 20% interlayered expanding lattice material. A. P.

GREENBERG (S. S.) & ELBERTY (W. T.). *Crandallite (pseudowavellite) from Gardner Mine Ridge, Lawrence County, Indiana.* Amer. Min., 1958, **43**, 983–985.

Crandallite, $CaAl_3(PO_4)_2(OH)_5.H_2O$, has been identified as a minor constituent of a brown halloysite clay. A. P.

Various

[Khalifa-Zade (Ch. M.)] Халифа-Заде (Ч. М.). Некоторые вопросы генезиса глинистых минералов осадочных глинистых пород. [*Some remarks on the genesis of clay minerals in sedimentary clay rocks.*] Исследование и использование глин. Издательство Львов. Унив. [The investigation and utilization of clays. Publishing House of Lvov Univ.], 1958, pp. 42–49.

A hypothesis that clay minerals in sedimentary clay rocks evolve by definite steps is propounded, and a semi-triangular diagram showing the genetic relationships of various clay minerals, simple and interstratified, is given. $R^{+}(H_3O)^{+}$ in the interlayer space varies in accord with Al^{3+} and Si^{4+} variation in the silicate lattice. To elucidate clay mineral formation both recent and ancient sediments must be examined and correlated. R. C. M.

Schwertmann (U.). *Die fraktionierte Extraktion der freien Eisenoxyde in Böden, ihre mineralogischen Formen und ihre Entstehungsweisen.* Zeits. PflErnähr. Düng., 1959, **84**, 194–204.

Examination of approx. 100 samples of iron mottlings, concretions, etc., shows that while sodium dithionite [M.A. **14**–14] removes all free iron oxides, ammonium oxalate at pH 3 in daylight removes only amorphous oxides. Goethite is the stable soil iron oxide mineral in humid climates ; it may be formed by ageing of ferric oxide gel, by oxidation of Fe^{2+} to Fe^{3+} with subsequent precipitation and ageing, or from $FeCO_3$. Lepidocrocite is formed by oxidation of Fe^{2+} compounds at not too high a CO_2 concentration. Hematite occurs in warmer climates but is not formed in humid climates. Maghemite may be produced from other oxides by the reducing action of organic matter. Amorphous iron oxide may be formed by hydrolysis of Fe^{3+} compounds ; the amorphous oxide in the samples investigated does not show the typical exothermic peak of the gel. R. C. M.

Michler (O.). *Über die Entstehung der Kaolin- und Tonvorkommen im Karlsbader Bergbaugebiet.* Ber. dtsch. keram. Ges., 1959, **36**, 191–196.

The kaolin deposits in the Karlsbad area (e.g. at Chodau and Zettlitz) are described and their origin discussed. It is concluded that they are related to vulcanism, and that they were formed by pneumatolytic processes or by hydrothermal metasomatism. R. C. M.

Graff-Petersen (Poul). *Lermineralogiske undersøgelser af Kvartærbjergarterne i Røjle Klint.* [Investigations of the clay mineralogy of the quaternary sediments in the Røjle Cliff.] Medd. Dansk Geol. Foren., 1958, **13**, 471–501, 15 figs. English summary 493–496.

The sediments investigated come from N.W. Fuen (Fyn), Denmark, and comprise interglacial marine 'Telli clay, glacial melt-water deposits, and boulder clay from three glaciations observed in Denmark. The clay miner are investigated by d.t.a., X-ray powder photographs, c.e determinations, and electron microscopy. The methods a their reliability are thoroughly discussed. The clay minera which occur in varying ratios, are: illites, montmorillonoi chlorite, kaolinite, halloysite, α-sepiolite and/or palyg skite, vermiculite(?), and 'mixed layer clay minerals'(?). H. M.

Mezösi (J.) & Kuvényi (E.). *Manganese minerals contai in the clay-minerals of Tokaj-Hegyalja.* Acta Mi Petr. Univ. Szeged, 1958, **11**, 29–42, 9 figs. (in Englis

The clay minerals are derived from rhyolite or rhyol tuff and at Bodrogszegi consist of kaolinite and halloysi at Fuzérradvány of illite-montmorillonite. Manganese most 0·05% in the rock) is concentrated in black specl less deeply coloured areas, and on joints. The mater consists of pyrolusite and psilomelane except in the case the black specks which are of a lower degree of oxidati and contain 24% Mn_3O_4 with both MnO and MnO_2 in u determined proportions. J. Ph.

Hamdi (H.). *Alterations in the clay fraction of Egyptian soi* Zeits. PflErnähr. Düng., 1959, **84**, 204–211.

A profile in the Nile delta deposit covering a period over 12,000 years was examined by X-ray, d.t.a., a electronoptical methods. The results indicate that illit clay, formed by the weathering of the eruptive rocks of t Ethiopian Plateau, is carried down the Nile and deposit in the delta in stagnant water. The illite is gradual altered to boehmite and an expanding-lattice mineral the montmorillonite type. Prolonged treatment of illi with CO_2-water in the laboratory gives analogous chang R. C. M.

[Seidov (A. G.)] Сеидов (А. Г.). Литолого-минералогическ изучение глин майкопской свиты Прикаспийск нефтеносной области Азербайджана. [*Lithological a mineralogical study of Maikop suite clays of Subcaspi petroliferous area of Azerbaidzhan.*] Изв. Акад. Нау СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol. 1959, **2**, 85–95, 4 figs.

This work is based on a number of chemical analyses clays and of their solubility in hydrochloric acid, as we as on the results of thermal analysis. The clays are com posed mainly of montmorillonite, beidellite, and hydromic S. I. T.

Harada (Z.) & Mitsuda (T.). *Boehmite in 'Rôseki'.* Jour Min. Soc. Japan, 1957, **3**, 314–321.

Boehmite in 'Rôseki' (agalmatolite) occurs as a hydro-rmal alteration product of liparite at Mitsuishi, Western pan, and is accompanied by pyrophyllite, kaolinite, and spore. X-ray, thermal and microscopic studies are orded : the diffraction pattern of boehmite persists up to)°C but the characteristic peaks disappear completely ove 600°C. R. A. H.

A (T.) & Yamamoto (T.). *Boehmite in some 'Rôseki' deposits.* Journ. Min. Soc. Japan, 1957, **3**, 322–325.

Boehmite from the Ebara mine, Hidaka Town, Hyago efecture, occurs in spherical nodules with small amounts kaolin minerals and diaspore : a chemical analysis of this terial gave SiO_2 2·95, TiO_2 0·04, Al_2O_3 80·60, Fe_2O_3 0·72, O 0·14, MgO 0·02, ign. loss 15·67, =100·14. R. A. H.

inzburg (I. I.)] Гинзбург (И. И.). Ближайшие задачи при решении важнейших проблем минералогии глин. [*Next steps in the solution of very important problems in clay mineralogy.*] Исследование и использование глин. Издательство Львов. Унив. [The investigation and utilization of clays. Publishing House of Lvov Univ.], 1958, pp. 7–33.

A review with 82 refs. covering Russian and foreign erature, of the classification, nomenclature, origin, and agenesis of clay minerals. Many problems awaiting lution are detailed. R. C. M.

azarenko (E. K.)] Лазаренко (Е. К.). Некоторые вопросы изучения глинистых минералов и глин. [*Some problems in the study of clay minerals and clays.*] Исследование и использование глин. Издательство Львов. Унив. [The investigation and utilization of clays. Publ. House of Lvov Univ.], 1958, pp. 34–41.

Geologically clays fall into two groups, exogenous luvial or weathering and sedimentary types) and endo-neous (hydrothermal and pneumatolytic types). In a assification of the clay minerals, after separation of inter-ratified types, four main groups are recognized : kaolinitic, ontmorillonitic, hydromicaceous, and chloritic. In this ction kerolite is equated with saponite, illite is considered be interstratified, and chrysocolla is regarded as a ember of the montmorillonite group—but no references e given to support these arguments. R. C. M.

rnst (Th.), Forkel (W.), & von Gehlen (K.). *Vollständiges Nomenklatursystem der Tone.* Ber. dtsch. keram. Ges., 1959, **36**, 11–18.

An extension of the authors' shorthand system for ming clays [M.A. **14**–17]. Various alterations to the iginal system are proposed (e.g. use of abbreviated mineral names in place of numerals as suffixes) and many examples of the practical applications of the method are given. R. C. M.

Brown (G.). *Report of the Clay Minerals Group Sub-Committee on Nomenclature of Clay Minerals.* Clay Min. Bull., 1955, **2**, 294–302.

A classification and nomenclature system is proposed for amorphous and crystalline clay minerals. In the latter it is suggested that the adjectives diphormic and triphormic be used for the 1 : 1 and 2 : 1 families, respectively. It is recommended that interstratified minerals be named individually if interstratification is regular, but that they be named after the components if random, and a convenient system for this is adduced. The new names kandites and smectites are proposed for the kaolin and montmorillonite groups, respectively. [A.M. **41**–536] R. C. M.

Gutiérrez Rios (E.) & MacEwan (D. M. C.). *Colloquium on clay minerals and related topics. Zaidín Experimental Station, Granada.* Clay Min. Bull., 1955, **2**, 318–319.

A report of the colloquium giving titles and brief abstracts of papers presented under the headings : 1, Interlamellar Complexes ; 2, Surface Properties ; 3, Mineral Identification and Crystal Structure. R. C. M.

Vaughan (F.). *Energy changes when kaolin minerals are heated.* Clay Min. Bull., 1955, **2**, 265–274.

Activation energy values for the decomposition of kaolin-group minerals indicate that the 'fireclay mineral' does not form a member of a kaolinite-halloysite series ; in addition a series of 'fireclay minerals' may exist. Thermodynamic calculations indicate that, if a compound is formed on dehydroxylation, the most likely explanation of the 980°C exothermic peak is the simultaneous production of mullite, γ-Al_2O_3, and amorphous silica. A calculation of the lattice energy of kaolinite gives a value of the order of 9×10^6 cal/g-mol. R. C. M.

Murray (P.) & White (J.). *Kinetics of clay dehydration.* Clay Min. Bull., 1955, **2**, 255–264.

The isothermal dehydroxylation of clays proceeds according to a first-order law, and Arrhenius parameters calculated on this basis enable clays to be divided into kaolinites, micaceous clays, and montmorillonites. A first-order law is consistent with clay-mineral structure and irreversibility of dehydroxylation is due to formation of highly stable ion configurations on removal of OH. From isothermal data, d.t.a. curves have been synthesized and it is shown that the reaction is approx. 70% complete at the peak and that heating rate markedly affects peak temperature. [M.A. **14**–96] R. C. M.

Allison (E. B.). *Quantitative thermal analysis of clay minerals.* Clay Min. Bull., 1955, **2**, 242–254.

Kinetic data evaluated from d.t.a. curves show that for clays a first-order law is obeyed [preceding abstract & M.A. **14**–96]. The derived activation energy (40–60 kcal/mole) agrees with that obtained from isothermal data [M.A. **14**–17]. A constant heat-flow method was used to measure specific heats and heats of dehydroxylation once sample porosity had been standardized. The heat of dehydroxylation of pure kaolinite is 115 cal/g and of montmorillonites 20–50 cal/g. Kinetic data derived again showed dehydroxylation to follow a first-order law.

R. C. M.

Sewell (E. C.). *The consequences for differential thermal analysis of assuming a reaction to be first-order.* Clay Min. Bull., 1955, **2**, 223–241.

Differential thermal curves for kaolinite are calculated theoretically assuming the dehydroxylation reaction to be first-order, as claimed by Murray & White [M.A. **14**–96]. Theory agrees with experiment as to effect of heating rate on the curve, but according to theory there should be an increase in peak temperature on dilution, when the peak temperature is measured at the centre of the sample. This is at variance with the decrease observed. It is concluded that water vapour concentration may affect the reaction and that the first-order law only holds approximately under d.t.a. conditions. R. C. M.

Parry (R. H. G.). *Latent interparticle forces in clays.* Nature, 1959, **183**, 538–539.

A figure illustrates the virgin consolidation curve and three rebound curves. During rebound the repulsive stress is less than the maximum intergranular repulsion, so an additional internal attractive stress is acting. When two atoms approach each other there may result a mutual disturbance of electron clouds, which is not reversible when separation of the two atoms is again increased. This may result in an attractive force tending to oppose the separation of the atoms. D. C. A.

Emerson (W. W.). *Stability of soil crumbs.* Nature, 1959, **183**, 538.

Stability of soil crumbs in water is greater from grassland than from corresponding arable soils. The increase is caused by the soil organic matter. Small additions of synthetic polymers, which can be non-ionic or carboxylated, also stabilise soil crumbs. It is suggested that both soil organic matter and soil conditioners increase the stability by linking the principal constituents, orientated clay and quartz particles. D. C. A.

Dietzel (A.) & Saalfeld (H.). *Untersuchungen an ein Dachziegel des Jahres* 1565. Ber. dtsch. keram. G 1959, **36**, 89–92.

Two roof tiles dated 1565 from Reisbach in Lo Bavaria gave X-ray patterns indicating approx. 50% qua 10% feldspar, and 3–5% hematite, the remainder be X-ray-amorphous material. The d.t.a. curve showed o a small endothermic effect at about 200°C, in addition the quartz inversion. Chemical analysis gave SiO_2 74· TiO_2 0·88, Al_2O_3 14·06, Fe_2O_3 4·36, CaO 0·65, MgO 1· Na_2O+K_2O 3·17, P_2O_5 0·14, SO_3 nil, Cl 0·05, ign. loss 0· =99·96. Various physical properties of the tiles have b examined and are compared with those for modern tiles R. C. M

Kerr (P. F.). *Formation and occurrence of clay minera* Proc. 1st Nat. Conf. Clays and Clay Min., Calif. Di Mines, Dept. Natur. Resources, 1955, Bull. **169**, 19–

A review of information on clay mineral formatio includes hypergene processes (temperature, thermal wate hydrothermal deposits), and supergene processes (norm surface action, weathering, diagenesis in saline wate alteration by organic acids, laterites, and bauxites). refs. D. C.

Brindley (G. W.). *Structural mineralogy of clays.* Op. c 33–43.

A general classification of the clay minerals on a str tural and chemical basis. This paper covers in part that Brindley and MacEwan in Ceramics, A Symposium, B Ceramic Soc., editor A. T. Green, 1953. Included are : latti parameters and chemical composition of layer silicat morphology of clay minerals (the structure of hydrat halloysite is discussed), relations between the kao minerals, the mica-type minerals, thermal and chemi transformations, of layer silicates from the structural poi of view, chamosite, and acid attack on chlorites. references. D. C.

Johnson (A. L.). *Particle size distribution in clays.* Op. c 89–91.

A review. Properties of clays are due to structure, surfa area, electro-kinetic or zeta-potential of the system, a admixed inorganic and organic impurities. Ion-exchan properties and the effect of the type and amount of io on the electro-kinetic potential require further stud Sedimentation, elutriation, and centrifugation are indire methods, and electron microscopy a direct method measuring particle size. D. C.

Davis (L. E.). *Electrochemical properties of clay minera* Op. cit., 47–53.

This paper deals with theoretical aspects of the influen

clay particles on ions. The electrochemical properties clays result from interactions between electrically harged particles, ordinary ions, and molecules of solvent. locculation and allied phenomena represent the effect of ns and solvent upon the particles. Catophoresis and lated effects are caused by interaction between particles d solvent. The fabric of the clay and the electrical fields rrounding the particles influence the behaviour of mole-les of solvent and ordinary ions. Theories discussed are : erst theory of junction potentials, theory of Michaelis, ay membranes (C. E. Marshall's investigations), colloidal embranes (Sollner's theory), application of the theory on on-equilibrium thermodynamics formulated by Onsager membrane phenomena (Staverman's theory). It is oncluded that further experimental work, utilizing new ethods of approach to the problem, is desirable. D. C.

EWIS (D. R.). *Ion exchange reactions of clays.* Proc. 1st Nat. Conf. Clays and Clay Min., Calif. Divn. Mines, Dept. Natur. Resources, 1955, Bull. **169**, 54–69.

A review. The mass action, adsorption isotherm, and Gibbs-Donnan equilibrium formulations of the ion exchange heory are discussed as they apply to clay systems. Recent rogress is summarized in (1) solution thermodynamics of ixed electrolytes as it is relevant to ion exchange pro-esses of clays ; (2) the contributions of the non-ideality of he clay-exchanger phase ; and (3) the work of swelling of lays which affects the ionic distribution in ion exchange eactions. 303 references. D. C.

ARSHAD (ISAAC). *Adsorptive and swelling properties of clay-water systems.* Op. cit., 70–77.

The clay-water system is discussed under (1), clay-water vapor system ; (2), clay-liquid water system in the gel tate ; (3), clay-liquid water system in the fluid state—astes and sols. Data are given for external and internal urface areas of clays, adsorption isotherms for mont-morillonite saturated with monovalent and divalent cations, water by a Ca- and Na-kaolinite, and Ca- and Na-mont-morillonite, the thermodynamics of water adsorption and desorption of montmorillonite ratio of liquid volume to solid volume at onset of gelation of montmorillonites, illites, and kaolinites saturated with various cations. Reduction in macroscopic swelling in the presence of salts is related to the effect of the salt on the water adsorption properties of the exterior rather than the interior surface of the particles. D. C.

MACEWAN (D. M. C.). *Interlamellar sorption by clay minerals.* Op. cit., 78–85.

A review. Interlamellar sorption is the penetration of ions and neutral molecules between the layers of a lamellar structure resulting in a reversible, one-dimensional swelling. Discussed are : methods of study of interlamellar sorption complexes by X-ray diffraction, measurement of the 001 spacing, mechanism of interlamellar sorption (the sorption of large complex ions is due to cation exchange, the ions being held to the negatively charged sheets by electrostatic forces), interlamellar sorption by other materials, e.g., graphitic acid, α-zinc hydroxide, halloysite, autunite, and protein complexed with montmorillonite. D. C.

KELLEY (W. P.). *Interpretation of chemical analyses of clays.* Proc. 1st Nat. Conf. Clays and Clay Min., Calif. Divn. Mines, Dept. Natur. Resources, 1955, Bull. **169**, 92–94.

Discusses analyses of clay minerals from point of view of isomorphous replacement within the minerals, accuracy of analyses, impurities, and exchangeable Mg. A method for calculating analyses of montmorillonites to cations per unit cell and distribution of elements in tetrahedral, octahedral, and interlayer positions is given. D. C.

OSTHAUS (B. B.). *Interpretation of chemical analyses of montmorillonites.* Op. cit., 95–100.

Ion exchange determinations of 10 untreated mont-morillonites (8 are A.P.I. standards) and chemical analyses of 6 of them (from Belle Fourche, South Dakota ; Clay Spur, Wyoming ; Plymouth, Utah ; Chambers, Arizona ; Polk-ville, Mississippi ; and Otay, California) are given together with the distribution of the charges on the lattice layers of 6 Na-saturated montmorillonites. Impurities in the samples are SiO_2 and cristobalite. Some samples were treated with 0·5 *N* NaOH [M.A. **12**–219] to dissolve excess SiO_2 and Al_2O_3. The importance of determining the amounts of impurities and recalculating the analyses before assigning elements to tetrahedral, octahedral, or interlayer positions in the structures is stressed. The ion exchange capacity of the purest montmorillonites varies only slightly with particle size. D. C.

GRIM (R. E.). *Petrographic study of clay minerals.* Op. cit., 101–104.

Petrographic examination has considerable value, particularly in identifying impurities in clays. The refr. ind. can be determined on oriented aggregates and accurate values for α and β obtained. A table gives optical properties of the principal clay minerals. D. C.

DODD (C. G.). *Dye adsorption as a method of identifying clays.* Op. cit., 105–111.

Reviews staining tests on clay minerals, in particular the artificially induced pleochroism of kaolin group minerals with aniline dyes, staining tests based on acid-base reaction

(malachite green and safranine Y tests for kaolin minerals), benzidine test for montmorillonites, and para-amino phenol test (oxidation-reduction mechanism) for montmorillonites and hydrous micas. Staining test procedures and the nature of the oxidizing agents on clay mineral surfaces are discussed.. D. C.

Nahin (P. G.). *Infrared analysis of clays and related minerals.* Proc. 1st Nat. Conf. Clays and Clay Min., Calif. Divn. Mines, Dept. Natur. Resources, 1955, Bull. **169**, 112–118.

Describes the method of infrared analysis and gives diagrams and data for infrared spectra of the kaolin group minerals, allophane, montmorillonite group, 'illite', attapulgite, talc, muscovite, biotite, gibbsite, brucite, α-quartz, and opal. D. C

Brindley (G. W.). *Identification of clay minerals by X-ray diffraction analysis.* Op. cit., 119–129.

Reviews methods and techniques of clay mineral identification up to 1952. 41 references. D. C.

Bates (T. F.). *Electron microscopy as a method of identifying clays.* Op. cit., 130–150.

Electron microscope studies show that most clay minerals have morphological characteristics that can be used to identify them. Detailed studies at high magnification have provided structural information not obtainable by other means. Excellent electronmicrographs illustrate the form of the common clay minerals. D. C.

Rowland (R. A.). *Differential thermal analysis of clays and carbonates.* Op. cit., 151–163.

A review of d.t.a. methods and results, with illustrations of curves for clay minerals, calcite, magnesite, siderite, and dolomite. 264 references. D. C.

Page (J. B.). *Role of physical properties of clays in soil science.* Op. cit., 167–176.

Reviews the effect of clays on soil structure, porosity, formation of aggregates, the stability of structure with organic compounds (both natural and artificial), swelling, and plasticity. D. C.

Buehrer (T. F.). *Role of chemical properties of clays in soil science.* Op. cit., 177–187.

Reviews the important effects of clay minerals on chemical and physical properties of soils, distribution of clay minerals in soils, soil pH and nature of clay acids, cationic activity of clays and soils, fixation and release of K in soils, NH_4- and PO_4-fixation. D. C.

Hveem (F. N.). *Importance of clay in applied soil mechanics.* Op. cit., 191–195.

Interparticle friction is the principal property whi permits soils and granular materials to resist load witho deformation. Clays are generally detrimental to stabilit Factors affecting design of road pavements are discussed. D. C.

Mielenz (R. C.) & King (M. E.). *Physical-chemical prope ties and engineering performance of clays.* Proc. 1 Nat. Conf. Clays and Clay Min., Calif. Divn. Mine Dept. Natur. Resources, 1955, Bull. **169**, 196–254.

A review. Headings are : Physical-chemical properti of clays ; Fabric ; Mineralogical composition ; Surfa chemical phenomena (adsorption, cation and anion e change) ; Electrokinetic properties ; Static properties earth materials ; Dynamic properties (plasticity, pe meability, thixotropy) ; Shear resistance ; Swelling wi hydration ; Drying shrinkage ; Frost heaving ; Clays an shales in concrete materials. 203 references. D. C.

Henry (E. C.). *Clay technology in ceramics.* Op. cit 257–266.

A review. To assure the most effective use of a clay th ceramic technologist must meet problems of purificatio ageing, bacterial action, and improvement of workin properties of clays through additions on non-plasti materials or chemicals. Flocculation, deflocculation, thixo tropy, and related phenomena in clays are importan properties. D. C.

Larsen (D. H.). *Use of clay in drilling fluids.* Op. cit 269–281.

A review. Discusses various aspects of clay in drillin muds and gives descriptions and ion exchange data fo clays used in the United States. These include mont morillonites, hectorite, attapulgite, 'illite', halloysite kaolinite, and surface clays from near oil wells. Attapulgit has properties quite different from those of the mont morillonites ; it is only feebly thixotropic and possesse shear strength and viscosity quite independent of electro lyte concentration. 83 references. D. C.

Wyllie (M. R. J.). *Role of clay in well-log interpretation* Op. cit., 282–305.

The electrochemistry of the shale cell in the earth ha been examined in the light of modern theories of charge membranes. It has been shown that the constancy of th shale baseline seems to indicate that shales, when subjecte to pressure, tend to behave as anion-impermeable mem branes. A tentative electrochemical shale structure i presented. D. C.

Johnston (Norris). *Role of clay in oil reservoirs.* Op. cit 306–313.

iscusses the presence of clay in oil sands of the United es. The effects of clay on oil-sand behaviour are hydra-, which results in swelling and partial loss of permea-y ; increase in compressibility ; amount of interstitial er present. The conducting solids in surface-active clays of special interest in interpreting electric logs. Clay icles are usually negatively charged in water, so that tive charges are attracted to the surface, and then me available for electrical conduction. D. C.

LIKEN (T. H.), OBLAD (A. G.), & MILLS (G. A.). *Use of clays as petroleum cracking catalysts.* Proc. 1st Nat. Conf. Clays and Clay Min., Calif. Divn. Mines, Dept. Natur. Resources, 1955, Bull. **169**, 314–326.

The changes taking place in a montmorillonite-, kaolinite-, or halloysite-clay structure on acid treatment and calcination are interpreted as involving the creation of a structure with physical and chemical characteristics and catalytic activity similar to synthetic silica-alumina gel catalysts. The original structure and chemical composition of the raw clay determine the degree and type of destruction taking place on acid and heat treatment. Consideration of experimental data for reversible hydration at high temperatures, loss of ammonia upon heating the ammonium-zeolite form, and titration experiments by base, leads to a concept of reversible coordination shift from 6 to 4 of the Al ion. This concept has been used to explain behaviour of clays in electrodialysis. D. C.

CRYSTAL STRUCTURE OF MINERALS

LLIAMS (P. P.). *Determination of lattice parameters directly from Bunn charts.* Acta Cryst., 1959, **12**, 250, 1 fig. J. Z.

RDANYANTZ (L. A.)] Варданянц (Л. А.). Дополнение к триадному методу исследования плагиоклаза и его двойников. [*Supplement to the triad method of investigation of plagioclase and its twins.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 3–12, 6 figs.

he triad method of the study of plagioclase twins was lished by the author in 1951 and the theory of the main ction in twins in 1957 [M.A. **14**–75]. The present work ls with a mathematical development of these two hods. S. I. T.

NDQUIST (D. V.)] Рундквист (Д. В.). О некоторых особенностях морфологии и внутреннего строения минеральных агрегатов оловорудных близповерхностых месторождений. [*Some particulars of the morphology and internal structure of mineral aggregates of tin ore near-surface deposits.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 423–439, 15 figs.

A detailed study of the morphology and internal structure aggregates of cassiterite, arsenopyrite-löllingite, quartz, d quartz with inclusions of blende, shows a similarity of ucture consisting of subparallel and twin intergrowth of arge number of crystal individuals. The genesis of such gregates is discussed. S. I. T.

IABIN (A. G.)] Жабин (А. Г.). Морфология и генезис параллельношествоватых агрегатов минералов. [*Morphology and origin of parallel rodded aggregates of minerals.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (5), 575–589, 10 figs.

This is a discussion of the mode of origin of 'parallel rodded' aggregates of crystals usually formed in the infillings of cracks in various rocks. S. I. T.

[EVZIKOVA (N. Z.)] Евзикова (Н. З.). К вопросу об изменении формы кристаллов минералов в процессе их роста. [*On modification of the crystal forms of minerals during the process of their growth.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (6), 647–656, 7 figs.

Colour zones and ghost zones of fluorite, barite, and calcite from Soviet localities provide information relating to the morphological stages of growth. In fluorite, for example, six types of zonal succession are distinguished. The most complex growth history is expressed by the scheme : {111}+{100}+{110}→{100}+{411}→{100}+{421}, in which the sign + brings together the forms of one combination, and the sign → indicates a transition to the next zone. A set of diagrams in which the successive forms show the atomic structures of their faces brings out the significant fact that there is a tendency for zoned crystals to form, during their growth, faces of less and less reticular density. The significance of this, and the literature bearing on the subject, are discussed. S. I. T.

[SHAFRANOVSKY (I. I.)] Шафрановский (И. И.). Ложные формы кристаллов и их минерагенетическое значение. [*Pseudo-forms of crystals and their mineragenetic significance.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 13–20, 3 figs.

This is a discussion of the morphology and symmetry of pseudo-forms of crystals as produced by varied conditions in their growth. S. I. T.

[Grigoriev (D. P.)] Григорьев (Д. П.). О проявлении спайности кварца в приводе. [*On cleavage of quartz in nature.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 418–422, 5 pls.

Evidence culled from various sources point to three planes of imperfect cleavage in quartz, {10$\bar{1}$0}, {0001}, and {10$\bar{1}$0}.
S. I. T.

Tokody (L.). *Quartzkristalle aus dem Gutingebirge.* Acta Min.-Petr. Univ. Szeged, 1958, **11**, 43–49, 3 figs.

A group of three quartz crystals from Kapnikbánya, Hungary, [M.M. **21**–467] includes two of sceptre-quartz which appear to be Japan twins. On one of these hexahedra of pale violet fluorite, a growth hitherto unknown on quartz, have grown, and on fluorite wine-yellow rhombohedra of chalybite. At Felsöbánya crystals of quartz show the forms {0001}, {10$\bar{1}$0}, {10$\bar{1}$1}, and {11$\bar{2}$1}; the face (0001) is splendidly developed. J. Ph.

Amelinckx (S.). *Dislocation patterns in potassium chloride.* Acta Metallurgica, 1958, **6** (1), 34–58, 43 figs.

Dislocation patterns observed in single crystals of potassium chloride, as grown, and after deformations, are analyzed. Large areas covered by regular square and hexagonal networks are found. Singularities in the networks are explained in terms of Burger's vectors and the genesis of the nets is considered. R. G. Wls.

Reed-Hill (R. E.) & Robertson (W. D.). *Additional modes of deformation twinning in magnesium.* Acta Metallurgica, 1957, **5** (12), 717–727, 18 figs.

Reference is made to work of Rosi, Perkins, and Seigle [Journal of Metals, February 1956] on deformation twinning in titanium. Evidence is presented for the existence of two additional modes of deformation twinning {30$\bar{3}$4} and {10$\bar{1}$3} produced by tensile stress parallel to the basal plane in magnesium single crystals. The crystallographic mechanism of formation of {30$\bar{3}$4} twins is discussed in detail because fracture occurs by a parting mechanism in this twin. R. G. Wls.

Reed-Hill (R. E.) & Robertson (W. D.). *The crystallographic characteristics of fracture in magnesium single crystals.* Acta Metallurgica, 1957, **5** (12), 728–737, 14 figs.

The fracture mechanism of magnesium was reexamined. Single crystals were strained in tension parallel to the basal plane. In the temperature range, 25° to 286°C, fractures occurred primarily in {30$\bar{3}$4} twins, while at −190°C the habit plane of fracture was {11$\bar{2}$4}. Previously reported (0002), {10$\bar{1}$1}, and {10$\bar{1}$0} cleavage planes of magnesium have not been confirmed by the present work. The ductibility of magnesium strained in parallel to the b plane is explained in terms of the fracture mechanism. R. G. Wl

Haasen (Peter). *Twinning in indium antimonide.* Jou Metals, 1957, **9** (1), 30–32, 2 figs.

Indium antimonide (zincblende structure) twins with rotation about a [111] direction. The twinning process also be described as a reflection in a {111} plane dra through the middle of the connecting bonds, provided t the indium and antimony atoms are interchanged in twin. R. G. Wl

Stanley (R. C.). *Etch pits on calcite cleavage faces.* Nat 1959, **183**, 1548, 1 fig.

Etch pits [M.A. **14**–176] have been examined unde surface-finish interference microscope [C. Baker of Holbo Ltd.]. Etch pits on surfaces parallel to the optic axis boat-shaped. C. H. K

Willis (B. T. M.). *An optical method of studying the diff tion from imperfect crystals. III. Layer structures stacking faults.* Proc. Roy. Soc. London, 1958, **248**, 183–198, 2 pls., 15 figs.

The reciprocal lattice intensity distribution has b determined quantitatively using a photomultiplier measure the optical diffraction intensities for simple cu structures with stacking faults of the type exhibited wollastonite [M.A. **12**-334], for close-packed-hexago structures with growth faults, and for face-centred-cu structures with deformation faults. D. McK

Roy (S.). *Variation in etch behaviour of jacobsite different cell dimensions.* Nature, 1959, **183**, 1256–12 1 fig.

The variation of etch behaviour of jacobsite can correlated with the amount of manganese present [M **9**–32]. C. H. K

Rao (C. N. R.). & Gregor (L. V.). *Polymorphic transiti in anhydrous sodium sulphate.* Nature, 1959, **183**, 13 1 fig. C. H. K

Radoslovich (E. W.). *Structural control of polymorph in micas.* Nature, 1959, **183**, 253.

There are six simple ways of stacking mica layers in ordered manner, based on 'inter-layer stacking angl Only three polymorphs are common in nature, and t have not been found. Lepidolite specimens with stacki on alternating 60° and 300° have been described. Po morphs based on angles of 60°, 180°, or 300° may be expec

occur infrequently, as considerable adjustments of gen positions on each layer face would be necessary.
D. C. A.

TAUT (E. F.), BLUM (P.), & SAGNIÈRES (A.). *Structure du ferrite bicalcique et de la brownmillerite.* Acta Cryst., 1959, **12**, 149–159, 3 figs.

M.M. **26**–335]. J. Z.

SS (VIRGINIA) & EDWARDS (JOHN O.). *On the crystal structure of kernite, $Na_2B_4O_7.4H_2O$.* Acta Cryst., 1959, **12**, 258.

Results of earlier studies [M.A. **5**–184, **6**–335] are incon-ent with results of nuclear magnetic resonance studies. nthetic crystals of kernite are monoclinic with a 7·022, ·151, c 15·676Å, β 108° 50′; space group $P2_1/c$ not $P2/c$. liminary X-ray analyses indicate a similarity to the acture of borax $Na_2B_4O_7.10H_2O$. Further investigation proceeding. [M.A. **14**–105] J. Z.

ARK (JOAN R.). *Studies of borate minerals. IV. The crystal structure of inyoite, $CaB_3O_3(OH)_5.4H_2O$.* Acta Cryst., 1959, **12**, 162–170, 5 figs.

Inyoite is monoclinic, $P2_1/a$ with a 10·63, b 12·06, c ·05Å, β 114° 02′±5′, $Z=4$, D calc. 1·873 g/cm³. The ucture was determined (on artificially prepared crystals) ng Harker sections, Patterson projections, and 'heavy m' techniques; refinement by electron density projec-ns and difference syntheses. Inyoite contains isolated $_3O_3(OH)_5\}^{2-}$ polyions as found in meyerhofferite, $B_3O_3(OH)_5.H_2O$, and in the synthetic dihydrate. The lyion is formed by two BO_4 tetrahedra sharing a corner d one BO_3 triangle linking two tetrahedra. Polyions are nnected to one another and to water molecules by bonding rough Ca ions and hydrogen bonds, forming chains of lyion-calcium-water parallel to [100]. Chains are linked erally by hydrogen bonding through water molecules. .A. **1**–241, 258, 409] J. Z.

ONDRATJEVA (V. V.)] Кондратьева (В. В.). Рентгеновское исследование преображенскита. [*X-ray study of preobrazhenskite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 330–330.

The result of the X-ray study of preobrazhenskite is: 16·30, b 9·14, c 10·57 kX, $a:b:c=1{\cdot}78:1:1{\cdot}167$, =1574·74 kX³. [M.A. **13**–300; A.M. **42**–704]
S. I. T.

ATTOW (G.) & ZEMANN (J.). *Neubestimmung der Kristallstruktur von Azurit, $Cu_3(OH)_2(CO_3)_2$.* Acta Cryst., 1958, **11**, 866.

The structure previously determined [M.A. **5**–180] is incorrect. The redetermination shows that all copper atoms are surrounded in a planar square co-ordination by 2(O) and 2(OH). The (OH) groups belong to three copper atoms and each oxygen of the CO_3 groups to one copper. Crystallographic constants are given as: a 5·00, b 5·85, c 10·35Å, β=92° 20′; monoclinic, space group $P2_1/c$, $Z=2$, D calc. 3·78 g/cm³. Structural features of deep blue Cu^{2+} compounds are discussed. [M.A. **7**–237, 495] J. Z.

KRSTANOVIĆ (ILIJA R.). *Redetermination of the oxygen parameters in zircon ($ZrSiO_4$).* Acta Cryst., 1958, **11**, 896–897.

More accurate oxygen parameters than those given in earlier work [M.A. **3**–185, 345, 432, 528] have been derived from Fourier syntheses. The space group $I4_1/amd$ ($Z=4$) is confirmed and cell parameters are given as a 6·6164, c 6·0150±0·0005Å; D 4·67 gm/cm³. J. Z.

[BELOV (N. V.) & SIMONOV (V. I.)] Белов (Н. В.) и Симонов (В. И.). Об изоморфных соотношениях между цирконием и титаном. [*On isomorphic relations between zirconium and titanium*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **125**, 888–889.

In the description of a new mineral seidozerite [M.A. **14**–178, 198] it was assumed that Zr is partly replaced by Ti, and Mg by Mn. Such replacements are possible if there are commeasurable ionic radii Ti^{3+} 0·83, Zr^{4+} 0·87, Mn^{3+} 0·71, and Mg^{2+} 0·78Å. S. I. T.

[МОКЕЕВА (V. I.)] Мокеева (В. И.). Кристаллическая структура склодовскита. [*The crystal structure of sklodowskite.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **124**, 578–580, 2 figs.

Sklodowskite, $MgU_2O_2(OH)_2(SiO_4)_2 5H_2O$, is monoclinic with a 16·74, b 7·01, c 6·59Å; β 96°, $Z=2$, $C_2{}^3{}_h=I2/m$. The structure is visualised as made of layers of $[(UO_2)_2(SiO_4)_2]^{4-}$ similar to the layers in uranophane, but half period displaced along c-axis. The layers are linked by Mg atoms, and in this case one of the oxygen atoms must be replaced by (OH). [M.A. **7**–108] S. I. T.

LIEBAU (F.). *Über die Kristallstruktur des Pyroxmangits (Mn, Fe, Ca, Mg) SiO_3.* Acta Cryst., 1959, **12**, 177–181, 5 figs.

Pyroxmangite from Iva, South Carolina, U.S.A., is triclinic with a 6·67$_1$, b 7·55$_7$, c 17·45Å, α 113·7°, β 84·0°, γ 94·3°, $Z=14$, D 3·8 g/cm³. The structure contains chains of SiO_4 tetrahedra $[(SiO_3)_n]$ parallel to c with seven tetrahedra in the identity period of the chain. Layers of chains alternate with layers of cations parallel to (110). The

structure has similarities to those of rhodonite (five tetrahedra repeat) and β-wollastonite (three tetrahedra repeat). Chemical and structural considerations suggest that only one in seven cation positions is suitable for Ca, so that the formula may be written $(Ca,Mg)(MnFeMg)_6(SiO_3)_7$. Other 'chain' structures are discussed. [M.A. **5**–143, **6**–528, **13**–13, 421, and following abstract] J. Z.

Liebau (F.), Hilmer (W.), & Lindemann (G.). *Über die Kristallstruktur des Rhodonits* $(Mn,Ca)SiO_3$. Acta Cryst., 1959, **12**, 182–187, 5 figs.

Rhodonite (from Franklin, New Jersey) is triclinic with a 6·68, b 7·66, c 12·20Å, α 111·1°, β 86·0°, γ 93·2°, $Z=10$, D 3·65 g/cm³. Chemical analysis gave oxide proportions: 4·03 MnO, 0·97 CaO, 5 SiO_2. The structure contains chains of SiO_4 tetrahedra $[(SiO_3)_n]$ parallel to c, the repeat unit of which contains five tetrahedra. Layers of chains alternate with layers of cations parallel to (110). The structure is similar to that of β-wollastonite $CaSiO_3$ (three tetrahedra periodicity) and pyroxmangite (seven tetrahedra periodicity) [see previous abstract]. Chemical and structural considerations suggest that of the cations which link the (SiO_3) chains, not more than one fifth can be calcium. The formula of rhodonite can thus be written $(Mn,Mg)_{1-x}Ca_xSiO_3$ $(0\leqslant x\leqslant 0{\cdot}2)$. [M.M. **24**–573] J. Z.

[Rumanova (I. M.) & Skipetrova (T. I.)] Румянова (И. М.) и Скипетрова (Т. И.). Кристаллическая структура лавсонита. [*The crystalline structure of lawsonite.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **124**, 324–327, 2 figs.

The space group of lawsonite D^{17}_{2h} is confirmed as well as the parameters a 8·83, b 5·80, c 13·20Å. The main structural features are the infinite rows of Al-octahedra parallel to b-axis. There are two such octahedra, connected by their edge situated on the mirror plane, in a length of a unit cell which contains four such rows. The cavities between the Al-octahedra and the diorthogroup are occupied by large Ca cations co-ordinated to six $O(H_2O)$ forming distorted octahedra which link the Al-octahedra. This structure explains the cleavages (001) and (100) in lawsonite.

S. I. T.

Náray-Szabó (I.) & Sasvári (K.). *On the structure of staurolite,* $HFe_2Al_9Si_4O_{24}$. Acta Cryst., 1958, **11**, 862–865, 3 figs.

A re-investigation of the structure of staurolite taking account of new chemical analyses [not quoted] leading to the formula $HFe_2Al_9Si_4O_{24}$ or $4Al_2SiO_5.AlOOH.2FeO$. The staurolite cell contains two of these molecules whereas the old formula was $2Al_2SiO_5.Fe(OH)_2$ with four molecule the unit cell. The two surplus Al^{3+} ions can be loc reasonably and the Fe^{2+}–O^{2-} distance has been impro The true space group is $C2/m$ and not $Ccmm$. [M.M. **23**– **31**–145; M.A. **4**–160] J.

[Serdyuchenko (D. P.)] Сердюченко (Д. П.). О соста генезисе дюмортьеритов. [*On the composition and ge of dumortierites.*] Изв. Акад. Наук СССР, Сер. П [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1958, **2**, 109–

Important data on dumortierites have been provide the publications by F. Fiala, and J. Losert [M.A. **13**– and on the basis of these and other data, the present au suggests the formula $(R^{3+},\ R^{2+}{}_{3/2})_4[Al_4BSi_3O_{19}(OH)]$. tetrahedral groups are centred on Si, B, and Al wit replacing Si with a compensating replacement of O by The Al–O octahedral chains are stable, but Al can, in a s measure, be replaced by Fe^{3+} and R^{2+}. S. I. T

Megaw (H. D.) & Wells (M.). *The space group of NaN and* $(Na_{0{\cdot}995}K_{0{\cdot}005})NbO_3$. Acta Cryst., 1958, **11**, 8 862, 1 fig. J.

[Kurbatov (V. V.)] Курбатов (В. В.). Рентгенометричес исследование виикитов Северной Карелии. [*X-ray st of wiikites from North Karelia.*] Зап. Всесоюз. М Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 328–330.

The X-ray powder photograph of wiikite agrees with t of pyrochlore, and its space group is $Fd3m$–O_h^7. S. I. T

[Bakakin (V. V.) & Belov (N. V.)] Бакакин (В. В.) и Бе (Н. В.). О кристаллической структуре хёрлбутита. *the crystalline structure of hurlbutite.*] Доклады Ан Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **1** 383–385.

Additional X-ray study was made on hurlbutite [M **11**–414] from a beryllium pegmatite of the Grand Sl Southern Rhodesia. It is proved that this mineral is orthorhombic, but monoclinic with $\beta\approx 90°$. Its Fedo group is $C^5_{2h}=P2_1/a$, analogous to that of beryllonite herderite. S. I. T

Bland (J. A.) & Basinski (S. J.). *Crystal symmetry struvite* (*guanite*). Nature, 1959, **183**, 1385–1387, 2 f

The space group determined from a single crystal fou in a tin of Japanese crab-meat is $Pnm2_1$ and not Pm Some of the features of the structure are predicted; crystals are piezo-electric. C. H. K

ECONOMIC MINERALS AND ORE DEPOSITS

GUENNELL (A. M.). *Metallogenic epochs in East and Central Africa.* First Meeting, East-Central Regional Committee for Geology, Dar-es-Salaam, 1956, 139–150.

The concept of metallogenic epoch and provinces is discussed in relation to epigenetic mineralization. Each epoch of mineralization with its own characteristic ore-mineral assemblage, may be definable as an event in a particular geological cycle. R. A. H.

[TATARINOV (P. M.), GRUSHEVOY (V. G.), & LABAZIN (G. S.), editors] Татаринов (П. М.), Грушевой (В. Г.) и Лабазин (Г. С.), редакторы. Общие принципы регионального металлогенического анализа и методика составления металлогенических карт для складчатых областей. [*General principles of a regional metallogenic analysis and of the methods of compilation of metallogenic maps of folded regions.*] Мат. Всесоюз. Науч.-Иссл. Геол. Инст. (ВСЕГЕИ) [Mat. All-Union Sci.-Prosp. Geol. Inst. (VSEGEI)] n.s. no. 22. Госгеолтехиздат [Gosgeoltekhizdat], 150 pp. Price 7 r. 20 k.

This volume contains seven articles, three of them with folding tables. The tables give : (1) the scheme of distribution of mineral deposits in the course of development of mobile belts of the earth's crust ; (2) ore complexes and genetic types of the endogenic deposits of the mobile belts ; (3) the main types of structural-metallogenic zones in mobile regions. The last of these tables presents, in a way, a summary of correlation of stages, types of mineral deposits and main chemical elements, facies of sedimentary and igneous rocks, and tectonic structures. In the text and in the tables the mineral deposits of the U.S.S.R. are used as illustrations of types of deposits. The titles of the articles may serve as short summaries of their contents.

[SEMENOV (A. I.) & SERPUKHOV (V. I.)] Семенов (А. И.) и Серпухов (В. И.). Общие принципы регионального металлогенического анализа. [*General principles of a regional-metallogenic analysis.*] (Pp. 5–20).

[DOMAREV (V. S.)] Домарев (В. С.). Осадочные и осадочно-эффузивные формации подвижных зон и их рудоносность. [*Sedimentary and sedimentary-effusive formations of mobile zones and their ore-bearing values.*] (Pp. 21–31).

[MOROZENKO (N. K.)] Морозенко (Н. К.). Интрузивные комплексы начальных, ранних и средних этапов. [*Intrusive complexes of the initial, early, and middle stages.*] (Pp. 32–64).

[LABAZIN (G. S.)] Лабазин (Г. С.). Рудные комплексы и типы эндогенных месторождений подвижных зон и их распределение в ходе геологического развия этих зон. [*Mineral complexes and types of endogenetic deposits of the mobile zones and their distribution during the course of the geological development of these zones.*] (Pp. 65–110).

[SEMENOV (A. I.)] Семенов (А. И.). Структурно-металлогенические зоны. [*Structural-metallogenic zones (or a regularity of space distribution of endogenetic mineral deposits in folded regions).*] (Pp. 111–128).

[DVORTZOVA (K. I.) & GORETZKAYA (E. N.)] Дворцова (К. И.) и Горецкая (Е. Н.). Методика составления металлогенических карт. [*Methods of compilation of metallogenic maps.*] (Pp. 129–149). S. I. T.

[SERPUKHOV (V. I.)] Серпухов (В. И.). Общие принципы регионального металлогенического анализа. [*General principles of regional metallogenic analysis.*] Советская Геология [Soviet Geology], 1955, **43**, 27–42.

Metallogeny, according to Y. A. Bilibin, is a branch of applied geology which studies the regularities in the distribution of mineral deposits in space and in time. In the present article the author outlines the principles of metallogenic survey of endogenic deposits, such as the principle of mapping of types of deposits according to the tectonic stages—pre-orogenic, syn-orogenic and post-orogenic—in the mobile regions of the earth. Methods of co-ordination of characters of sedimentary deposits, igneous activity, and tectonics with types of mineral deposits are outlined and the metallogenic analysis is applied to the Urals, southern Tian-Shan, and the Baikal region. S. I. T.

[SEMENOV (A. I.)] Семенов (А. И.). Принцыы и методика составления металлогенической карты восточного Казахстана. [*Principles and methods of compilation of a metallogenic map of eastern Kazakhstan.*] Советская Геология [Soviet Geology], 1957, **58**, 110–127, 1 map.

Metallogenic analysis and preparation of metallogenic maps are illustrated by the concrete example of a territory which shows a great variability in the distribution of mineral deposits, variable lithological and igneous facies, and complex tectonic structure. S. I. T.

[SHATALOV (E. T.)] Шаталов (Е. Т.). О металлогении рудных районов. [*On the metallogeny of ore regions.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1958, **9**, 37–51.

A brief review of the progress of metallogeny and of the

preparation of metallogenic maps in the U.S.S.R. is given. Besides the very important practical value of this work, metallogenic analysis contributes to the following geological problems : relation between ore deposits and magmatism, classification of typical ore regions in mobile belts and platforms, and development of genetic classification of ore deposits on a geotectonic basis. S. I. T.

[Smirnov (V. I.)] Смирнов (В. И.). Опыт металлогенического районирования территории СССР. [*An attempt to make a metallogenetic survey of the territory of the U.S.S.R.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1959, **4**, 3–21, 2 figs.

A general survey of metallogenic provinces and epochs is given. Nine provinces and six epochs provide a rough division. The majority of provinces are bicyclic, some are even tricyclic. A map and a diagram provide a visual illustration to the text. S. I. T.

[Chaikovskii (V. K.)] Чайковский (В. К.). Новые данные о тихоокеанском поясе. [*New data on the Pacific Ocean belt.*] Советская Геология. [Soviet Geology], 1956, **50**, 134–149, 8 figs.

In 1945 S. S. Smirnov suggested the existence of two metalliferous circum-Pacific belts : an inner belt of Cu–Ag minerals often associated with acid igneous rocks ('leucocratic') and an outer belt of Sn–W minerals often associated with basic igneous rocks ('mesocratic'). This idea was further developed by Y. A. Bilibin. The present author discusses the zonal structure of metalliferous provinces of various districts bordering the Pacific Ocean. S. I. T.

[Karasik (M. A.)] Карасик (М. А.). О связи между размерами рудных полей и главнейшими их геохимическими особенностями. [*On the relation between the dimensions of ore fields and their main geochemical features.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **125**, 1315–1318.

The ore fields of the Urals and the Turgai depression are classified into six groups according to the relative period of mineralization (pre-, syn- and post-skarn), and these are correlated with ten types of ores of Fe, Mn, Cu. S. I. T.

[Ovchinnikov (L. N.)] Овчинников (Л. Н.). Некоторые вопросы магматогенного рудообразования. [*Some questions of magmatogene ore formation.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1959, **4**, 22–39, 10 figs.

Recent experimental studies of silicate melts in the light of hypotheses of the structure of liquids, such as that by O. A. Esin and the work of Y. I. Olshansky, on the relati of iron oxides and silicate melts, suggest that the liq magma represents an ionic-electronic microheteroge fluid, in which certain groups containing metallic ions te to segregate and form globules, which can either coale and form immiscible fractions or be carried by gas bubb into the upper part of magma reservoirs. In such wa different types of magmatic and post-magmatic depos could be formed, some helped by the assimilation of lim stone by the magma. S. I. T.

[Kashkay (M. A.)] Кашкай (М. А.). О генетической свя месторождений колчеданных и некоторых медных полиметаллических руд с кислыми магмами. [*On a gene association of deposits of pyritic and certain copper a polymetallic ores with acid magmas.*] Советская Геолог [Soviet Geology], 1956, **50**, 102–124, 5 figs.

A survey of pyritic ore deposits of the 'porphyry ore' ty in the Caucasus, Urals, Altai Mts., and other localiti suggests a definite genetic association of these ores with ac porphyries and allied rocks. A bibliography is given. S. I. T.

Agard (Jules). *Les gîtes minéraux associés aux roch alcalines et aux carbonatites.* Sciences de la Ter Nancy, 1956, **4**, 103–151.

The author considers the origin of the alkaline rocks ar carbonatites, the various processes leading to formation mineral deposits in the course of emplacement of the rocks or of their later alteration—intramagmatic, pegma titic, pneumatolytic, hydrothermal, alteration at the su face, concentration in placers. The deposits studied a grouped according to their element or mineral : P, Ni-T Ld, Zr, Ti, Th-U, Fe-Mn, F, Sr-Ba, Al, Na-K, Au-Te, Mo ; vermiculite, clay, and chalk. In an appendix is given geochemical diagram of the principal elements concer trated in these rocks. Bibliography. [M.A. **13**–525]. E. J.

[Gerasimovsky (V. I.)] Герасимовский (В. И.). Задач генетической минералогии. [*Problems of genetic mine alogy.*] Вопросы геохимии и минералогии, Акад. Нау СССР. [Problems of Geochemistry and Mineralog Acad. Sci. U.S.S.R.], 1956, 129–138.

The main objects of genetic mineralogy are defined an discussed. These are : regularities in the change of miner associations in space and time : relation between the typ of minerals and the type of deposit ; study of later processe and wider problems relating to the distribution of ores i the earth. S. I. T.

RLIKH (E. N.)] Эрлих (Э. Н.). О роли природных электрических токов в образовании подзоны выщелачивания сульфидных месторождений. [*On the role of natural electric currents in the formation of a leaching subzone of sulphide deposits.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (5), 567–574, 5 pls.

This is a further argument in favour of the author's pothesis. [M.A. **14**–37] S. I. T.

AN GANSE (R.). *Propriétés et applications des latérites au Congo Belge*. Mem. Acad. roy. Sci. colon., Classe Sci. Techn., Bruxelles, 1957, no. 6, 46 pp., 14 figs.

The principal types of Congo laterites, their properties, nd the deposits are described. J. M.

HOUBERSKY (A.). *The operation of the Iron Ore Company of Canada*. Trans. Inst. Mining & Metall., London, 1958, **67**, 33–88, 8 figs., 6 pls.

An account of the many aspects of the development of he iron mines in the Knob Lake area [54° 45′N, 66° 50′W] f the Labrador-Quebec peninsula includes details of the eology of the central section of the iron ore belt. The area ontains a series of slightly metamorphosed late pre-ambrian sedimentary and volcanic rocks ; the iron ores ccur chiefly in chert and consist of magnetite and haema-ite together with minnesotaite and iron carbonates. To he south of the area increasing metamorphism has given ise to magnetite-specularite schists with grunerite. Local nrichment has taken place by the leaching of silica and lso by the introduction of goethite and pyrolusite along issures, leading to ore bodies with around 50% Fe. Forty-our such ore bodies, containing 418 million tons, have been roved in a strip 55 miles long and 12 miles wide.

R. A. H.

PLAKSENKO (N. A.)] Плаксенко (Н. А.). О некоторых особенностях строения толщи метаморфических пород докембрия КМА, причинах их возникновения и их стратиграфическом значении. [*On some specific features in the structure of pre-Cambrian metamorphic rock masses of the Kursk Magnetic Anomaly, causes of their origin, and their stratigraphic significance.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1959, **3**, 60–80, 13 figs.

A detailed statistical study of the succession of the principal metamorphic rock types shows that they were primarily conditioned by the facial characters of the original deposits and their mode of formation. Thus the iron ore deposits can be subdivided into magnetite type (shallow water, thin-bedded deposits), and hematite type (thicker deposits of a deeper marine zone.) S. I. T.

KABESH (M. L.), AFIA (M. S.), & WIDATALLA (A. L.). *Fodikwan iron deposits*. Geol. Surv. Dept., Republic of the Sudan, 1958, Bull. **4**, 24 pp., 16 figs.

The Fodikwan iron ores have been emplaced in a series of pre-Cambrian meta-sediments, epidiorites and granites in the Dungunab district, north-eastern Red Sea Hills. The ore occurs massive, as veinlets and stringers, and as disseminated grains in the country rock. The minerals include magnetite, often in octahedral crystals, as the primary constituent of the ore, together with hematite isomorphous after magnetite, and micaceous hematite : goethite, siderite, limonite, and pyrite also occur. The ore is believed to have originated from an ascending hydrothermal or pneumatolytic solution. R. A. H.

NICHOLSON (D. S.) & FYFE (H. E.). *Borehole survey of North Island* [*New Zealand*] *ironsands from New Plymouth to Kaipara harbour*. New Zealand Journ. Geol. Geophys., 1958, **1**, 617–634, 11 figs.

A reconnaissance survey indicates that over 600 million tons of magnetically recoverable ironsand assaying 58% Fe is present. The most important deposit, near Kawhia harbour, contains some 173 million tons in concentrations varying from 41% to 87% of recoverable ironsand. The main ironsand mineral is titanomagnetite, but ilmenite is also found north of the mouth of the Waikato river. [M.A. **10**–222] W. A. W.

NICHOLSON (D. S.), CORNES (J. J. S.), & MARTIN (W. R. B.). *Ilmenite deposits in New Zealand*. New Zealand Journ. Geol. Geophys., 1958, **1**, 611–616, 1 fig.

On the west coast of the South Island upwards of 1000 million tons of dredgeable sand is present from which ilmenite and small amounts of radioactive minerals and gold could be recovered. The most important locality is near Westport, where deposits are estimated to contain over 90 million tons of sand averaging 5·5% ilmenite. Analyses of ilmenite samples show : TiO_2 between 44 and 45%, V_2O_5 less than 0·05%, MnO 2·5%, and Cr_2O_3 less than 0·01%.

W. A. W.

KAADEN (G. VAN DER). *On relationship between the composition of chromites and their tectonic-magmatic position in peridotite bodies in the SW of Turkey*. Bull. Min. Res. Exploration Inst. Turkey, 1959, **52**, 1–14, 1 folding geol. map.

Fifty-six analyses of chromite from deposits in the peridotite belt of the province of Mugla, SW Turkey, are given. The chromites at higher levels within the ultrabasic body have a higher Al_2O_3 : MgO ratio than in the lower levels. The tectonic units produced by thrust-movements in the Alpine diastrophism can thus be referred, by composition

of their chromites, to their original position in the peridotite body. Only the chromites of the lower levels of the peridotite are of economic importance. Protoclastic effects in olivine and pyroxene indicate differential movement in crystalline material. J. Ph.

Graham (J. W.) & Cooper (S. C.). *Biological origin of manganese-rich deposits on the sea floor.* Nature, 1959, **183**, 1050–1051.

New evidence supports the argument that manganese-rich deposits of the sea floor originate through biological rather than inorganic processes. C. H. K.

Lyon (R. J. P.) & Scott (B.). *Stratigraphical and structural ore controls on the Slitt Vein at Heights mine, Weardale, County Durham.* Trans. Inst. Mining & Metall., London, 1957, **66**, 273–282, 5 figs.

Slitt vein is a mineralized fault 13½ miles long with lenses of fluorite and minor galena and sphalerite. Thick shales have acted as 'blankets' to the ore, providing largely impermeable barriers which channelled the ore solutions to form horizontal ribbon ore-shoots. Strong feather faults provide loci for the richest ore in lenses off the main vein. R. A. H.

[Shcheglov (A. D.)] Щеглов (А. Д.). О некоторых особенностях формирования ртутно-сурьмяно-вольфрамовых месторождений Забайкалья. [*On some features of the mercury-antimony-tungsten deposit of the Transbaikal region.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 48–59, 15 figs.

Four stages of mineralization are postulated : (1) milky quartz with a few crystals of ferberite, antimonite, and cinnabar ; (2) main mass of antimonite associated with a grey, comby quartz ; (3) mainly ferberite ; (4) main mass of cinnabar associated with a light-coloured quartz. S. I. T.

[Gratcheva (O. S.) & Zolotova (I. V.)] Грачева (О. С.) и Золотова (И. В.). Характерные особенности некоторых оловорудных месторождений среднего течения р. Колымы. [*Peculiar features of certain tin deposits of the middle reaches of the river Kolyma.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (3), 275–285, 4 figs.

The tin deposits in this region are of skarn, greisen, quartz, and quartz-topaz types, and all are associated with granitic intrusions of Upper Jurassic-Lower Cretaceous age. For each type of cassiterite deposit a paragenetic association is described and chemical analyses of cassiterite, axinite, danburite, and sphalerite are given. The order of formation of minerals is discussed and it is pointed out that in [illegible] region there is a close geochemical association between boron, and iron. S. I. T[illegible]

[Brodin (B. V.)] Бродин (Б. В.). Минералы олова и [illegible] парагенезис в рудах месторождений Курганского у[illegible] Галасского Алатау. [*Tin minerals and their paragene[illegible] in ores of the Kurgansky group of the Talassky Alata[illegible]* Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. So[illegible] 1959, **88** (2), 144–151, 6 figs.

The following minerals are described : cassiterite, st[illegible] nite, franckeïte, and canfieldite. S. I. T[illegible]

Varlamoff (N.). *Succession des minéralisations stannifè[illegible] et de wolframifères au Maniema.* Ann. Soc. Gé[illegible] Belgique, 1957–58, **81**, **B**, 275–281, 2 photos.

At Maniema, Belgian Congo, wolframite has crystalliz[illegible] before cassiterite crystals of intermediate and low temper[illegible] ture forms. A portion of the low temperature cassiter[illegible] has crystallized after the emplacement of veins of scheeli[illegible] J. M.

Lancsweert (P.). *Note sur les columbo-tantalites [illegible] Maniema.* Bull. Acad. roy. Sci. Colon., Bruxell[illegible] 1954, no. 25, 464–475, 1 map.

Historical and economic account of this deposit in t[illegible] Belgian Congo. J. M.

Prigogine (A.). *Concentration des minerais de wolfram et [illegible] niobium-tantale au Congo Belge et au Ruanda-Urun[illegible]* Mem. Acad. roy. Sci. Colon., Classe Sci. Techn[illegible] Bruxelles, 1956, **4**, 191 pp., 19 figs., 1 map.

Catalogue of the mineral deposits of Sn, Nb, and Ta, wi[illegible] numerous analyses. Evaluation of the deposits is made, an[illegible] processes of concentration of the ores are described. J. M.

Legraye (M.). *Quelques particularités nouvelles du giseme[illegible] de wolfram de Montredon (Tarn, France).* Ann. So[illegible] Géol. Belgique, 1957–58, **81**, **B**, 197–201, 1 fig.

Veins of quartz with wolfram are related to a mass [illegible] granulite ; mineralization occurs in the apical part of th[illegible] mass and is found again within the schists occupyin[illegible] depressions in its roof. J. M.

Frondel (C.) & Weeks (A. D.). *Recent progress in th[illegible] descriptive mineralogy of uranium.* Proc. 2nd U.N[illegible] Intern. Conf. Peaceful Uses of Atomic Energy, 195[illegible] **2**, 277–285.

Present knowledge of uranium mineralogy and cryst[illegible] chemistry is briefly reviewed. Some 85 minerals are tabu[illegible] lated with their synonyms, composition, symmetry, autho[illegible]

nd date of first description, references to X-ray powder ata, and a definitive summary. Selected aspects of recent U.S. research are discussed under the headings uraninite, uranium oxide hydrates, and uranyl carbonates, sulphates, hosphates and arsenates, vanadates, molybdates, and ilicates. Uraninite can crystallize directly from solution n a more or less oxidized state, the extent of oxidation ncreasing with increasing pH and Eh and with decreasing emperature. Thus pegmatitic uraninite is little oxidized, whereas that of the Colorado Plateau deposits is highly oxidized. Only a fraction of the uranium in the black ores of the Plateau is in uraninite or coffinite ; most of it is dispersed in amorphous black UO_3. Radiogenic lead has been shown to be present in uraninite as Pb^{2+} and does not substitute for U atoms. Minerals of the zippeïte group, hitherto regarded as simple hydrated uranyl sulphates, have each been found to contain a cation (K, NH_4, Na, Co, Ni, Fe, Mg, or Zn) in addition to the uranyl ion. Three groups of isostructural members are reported ; the name zippeite is restricted to the K compound. All the known naturally occurring uranyl silicates have been synthesized hydrothermally, as well as several chemical analogues not yet found in nature. [M.A. **13**–220, 495] R. K. H.

Mingarro (E.) & Catalina (F.). *The geochemical process of alteration of primary uranium ores and the electron microscopic study of these ores.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 204–210, 7 figs., 1 table.

Techniques used in the study of Spanish uraniferous veinstuff are described. It is shown that primary and secondary pitchblende occur in the veins and that the latter and associated torbernite have a common origin.

J. R. H.

Rafalsky (R. P.). *The experimental investigation of the conditions of uranium transport and deposition by hydrothermal solutions.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 432–444, 16 figs., 5 tables.

Experiments on precipitation of UO_2 from uranyl solutions by reduction with H_2S and Fe^{2+} are described. It is shown that at elevated temperatures and pressures pyrite, chalcopyrite, galena, siderite, hornblende, and organic matter in carbonaceous shales will cause reduction of U^{6+} in acid solution with precipitation of uraninite. J. R. H.

Roubault (M.) & Coppens (R.). *Migration of uranium in crystalline rocks and the possible relation of this phenomenon to the genesis of certain deposits.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 335–337, 3 figs.

Autunite [?meta-autunite I, II] has been found at 29 localities in addition to those previously described [M.A. **13**–501] in the Mortagne-sur-Sèvre granite batholith. The uranium contents of both autunite-bearing and surrounding granites are similar, ranging from 3·6 to 23·6 p.p.m. In the surrounding granites uranium occurs partly in discrete microscopic inclusions and partly in a dispersed form in chlorite and chloritized biotite, where it appears to be adsorbed on finely disseminated iron oxides. Migration of uranium in granites is thus related to their alteration. The release and concentration of uranium under these conditions are discussed and a mechanism evoked for the formation of both primary and secondary uranium minerals.

R. K. H.

Grimbert (Arnold). *Sur l'origine des imprégnations uranifères des schistes houillers de Saint Hippolyte (Haut-Rhin).* Bull. Soc. géol. France, 1956, **6**, 707–712.

The hypothesis of a sedimentary origin for the uraniferous mineralization of the Carboniferous beds which lie within the granite porphyroid is not to be regarded as eliminated in spite of the presence of sulphides which classically are considered to be of hydrothermal origin—pyrite, galena, blende, chalcopyrite, arsenopyrite. E. J.

Derricks (J. J.) & Oosterbosch (R.). *The Swambo and Kalongwe deposits compared to Shinkolobwe ; contribution to the study of Katanga uranium.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 663–695, 46 figs.

These two small deposits are situated 36 and 145 km respectively west of Shinkolobwé. Both occur on faults cutting the Mine Series. The age of mineralization is about the same as at Shinkolobwe. For each deposit details are given of the stratigraphy, tectonics, prospecting, drilling, mining, and economic possibilities. Minerals recorded at Swambo include uraninite, curite, kasolite, soddyite, sklodowskite, 'gummite', uranophane, and metatorbernite, together with siegenite, pyrite, chalcopyrite, covellite, vaesite, digenite, gold, heterogenite, libethenite, monazite, and nickeliferous chrysocolla. Those at Kalongwe include uraninite, vandenbrandeite, cuprosklodowskite, uranophane, and torbernite, along with pyrite, carollite, chalcopyrite, chalcocite, oligonite, covellite, chrysocolla, malachite, black cobalt oxides, dolomite, and amesite [not amenite]. The paragenesis of each deposit is discussed and comparisons drawn with Shinkolobwe. R. K. H.

Beck (A. C.), Reed (J. J.), & Willett (R. W.). *Uranium mineralization in the Hawks Crag breccia of the lower Buller gorge region, South Island, New Zealand.* New Zealand Journ. Geol. Geophys., 1958, **1**, 432–450, 8 figs.

Bedded uraniferous deposits in the middle (?)Cretaceous

Hawks Crag breccia of the lower Buller gorge and of three areas to the south of this district are described. The mineralization in all the areas is restricted to the arkosic facies of the Hawks Crag breccia. On the north side of the Buller gorge at least ten uraniferous horizons, ranging in width from a few inches to several feet, are known. Mineralization is patchy, varying from less than 0·025% to 6·4% U_3O_8. The main primary uranium mineral is coffinite [Nature, 1957, vol. 179, p. 546]; it is accompanied by pyrite, carbonate (largely ferroan dolomite with ω 1·6985, ε 1·5150, $\pm$0·0005), occasional purple fluorite, and hematite staining of clastic feldspar. Secondary uranium minerals are inconspicuous, but include autunite and uranophane. The deposits are considered to be due to low temperature mineralization of the breccia by epigenetic solutions, but it is still uncertain whether the uranium originated from dispersed sources in the arkosic sediments or was introduced in hypogene solutions from lamprophyres and porphyries. Minor uranium concentrations occur in a porphyry dyke cutting the Hawks Crag breccia, and in adjacent granite-gneiss and greywacke. A comparison is made between mineralization in the Buller gorge and on the Colorado plateau. W. A. W.

Stow (Marcellus H.). *Uranium in Virginia.* Virginia Minerals, 1955, **1** (4), 1–4, 1 fig.

Field reconnaissance studies of radioactivity were conducted by making road traverses with a scintillation counter mounted in a car. No deposits of commercial significance were discovered, but a few areas showed anomalous radioactivity. These areas, which might be worthy of further and more intensive investigation, are outlined and shown on a map. R. S. M.

EXPERIMENTAL MINERALOGY

[Klevtzov (P. V).] Клевцов (П. В.) К вопросу о плотностях растворов в системе H_2O-NaCl-KCl. [*Densities of solutions of the system H_2O–NaCl–KCl.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 93–96, 2 figs. S. I. T.

Remeika (J. P.). *Growth of single crystal rare earth orthoferrites and related compounds.* Journ. Amer. Chem. Soc., 1956, **78** (3), 4259–4260, 2 figs.

Small single crystals of rare earth orthoferrites of type $A^{3+}B^{3+}O_3^{2-}$ (A=Y, La, Pr, Nd, Eu, Sm, Gd; B=Al, Sc, Cr, Fe, Co, Ga) were prepared by supersaturation of solutions of the constituent oxides with PbO as the solvent. The constituent oxide/PbO ratio was 1 : 6 by weight. The melts were prepared at 1300°C in Pt crucibles and the cooling rate to 850°C was 30°/hr. PbO loss by volatilization and corrosion of the Pt crucible are kept to a minimum by minimum 'soak' times and minimum PbO concentration, respectively. R. C. D.

Kitchener (S. A.) & Strickland-Constable (R. F.). *Growth and evaporation of crystals from the vapour phase.* Proc. Roy. Soc. London, 1958, **245**, **A**, 93–111, 9 figs.

The rates of growth and evaporation of single crystal faces of rhombic sulphur [111] and benzophenone, [110], [111], and polycrystalline, have been measured by a torsion balance technique. At high supersaturation the rates are proportional to the relative supersaturation; at low supersaturation the rates become increasingly depressed. The observations are only qualitatively in accord with Frank's theory. D. McK.

Holmquist (S. B.). *A note on the sluggish silica transformations.* Zeits. Krist., 1958, **111**, 71–76, 1 fig.

Some controversial points in the interpretation of Ostwald's step rule and the thermodynamically possible silica transformations are examined. Evidence is presented in support of the view that tridymite is not a stable phase of pure silica at ordinary pressure. R. A. H.

[Sinelnikov (N. N.)] Синельников (Н. Н.). О спайности кристобалита и структурных превращениях кварца. [*On cleavage of cristobalite and structural transformations of quartz.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1957, **87** (6), 657–666, 8 figs.

Experiments on heating quartz fragments and studying the product on the Fedorov stage show that the newly formed high temperature cristobalite crystals have cleavage planes {110} and that one of the planes is perpendicular to the optical axis of the quartz. The transformation of quartz into cristobalite and of cristobalite into tridymite is produced by the break of Si–O bonds and subsequent rotation of SiO_4 chains. These transformations occur in the solid state. S. I. T.

Chaklader (A. C. D.) & Roberts (A. L.). *Sintering of quartz crystal.* Nature, 1959, **183**, 1252–1253, 2 figs.

At temperatures above 1470°C, the transformation of quartz into cristobalite is an indirect process involving the formation of an unstable non-crystalline silica phase. C. H. K.

Sato (Taichi). *The dehydration of alumina trihydrate.* Journ. Appl. Chem., 1959, **9**, 331–340, 6 figs.

Describes an experimental investigation into the thermal decomposition of aluminium trihydrate and suggests relationships between hydrargillite (gibbsite), bayerite, boehmite, and alumina. G. S. G.

Brown (J.), Jaap (W. J.), & Ritchie (P. D.). *Physico-chemical studies on dusts. X. A comparative study of the solubility and adsorptive properties of finely divided silica and titania.* Journ. Appl. Chem., 1959, **9**, 153–159, 7 figs.

Discusses the existence of a disturbed surface layer on finely divided quartz and rutile. G. S. G.

Wheatley (K.). *Measurement of the surface area of tridymite.* Journ. Appl. Chem., 1959, **9**, 159–162.

The results suggest that tridymite, in contrast to quartz, has neither a fine external surface structure nor an 'amorphous' layer. G. S. G.

Paterson (M. S.) & Wheatley (K.). *Solubility and heat of wetting of silica powders.* Journ. Appl. Chem., 1959, **9**, 231–240, 3 figs. G. S. G.

Shafer (M. W.) & Roy (Rustum). *Hydrothermal study of chromium orthophosphate.* Journ. Amer. Chem. Soc., 1956, **78** (1), 1087–1089, 3 figs., 2 tables.

The synthesis of a phase, whose composition from weight loss data appears to be $2\,CrPO_4.H_2O$, is reported from hydrothermal treatment of both hydrated and anhydrous $CrPO_4$. The new phase is olive-green, birefringent, with refractive ind. near $1{\cdot}810 \pm 0{\cdot}006$. A comparison of X-ray diffraction data for the new phase and electron diffraction data (both given in a table) for a previously reported 'amorphous to X-rays' material indicates these two forms are identical. The stability relations among the hydrous and anhydrous phases are summarized. No silica mineral analogues are expected with Cr^{3+}. R. C. D.

Griffith (E. J.). *New sodium phosphates.* Journ. Amer. Chem. Soc., 1956, **78** (3), 3867–3870, 4 figs.

Crystalline acid metaphosphate salts of compositions $Na_2H_2(PO_3)_4$, $Na_2H(PO_3)_3$, $[Na_3H(PO_3)_4]_n$, $Na_2(NH_4)_2(PO_3)_4$, $CaNa_2(PO_3)_4$, $K_2Na_2(PO_3)_4$ were prepared by heating mixtures of acidic phosphates in which M_2O/P_2O_5 is <1 until $(M_2O+H_2O)/P_2O_5=1$ (M = one equivalent of cation exclusive of H cations ; H_2O is water of composition rather than water of crystallization). Synthesis is highly susceptible to presence of seeds and undesired phases must be removed. X-ray patterns and crystal properties are given for the sodium acid metaphosphates and an approximate phase diagram for the $NaPO_3$–HPO_3 system is shown. The compounds tend to have a fibrous habit. R. C. D.

Zettlemoyer (A. C.) & Schneider (C. H.). *The hydration of sodium triphosphate.* Journ. Amer. Chem. Soc., 1956, **78** (3), 3870–3871, 2 figs.

'Hydration' vapor pressures and rate of hydration were determined for the non-equilibrium anhydrous–hydrate transformation of the two crystalline modifications of anhydrous sodium triphosphate. The high temperature phase hydrates much more rapidly than the low temperature form. 'Hydration' pressures for the high form are 10 and 41mm at 25°C and 50°C, resp. ; and 12 and 64mm at the same temperatures for the low form. The measurements were made by determining weight gain of the anhydrous salts in controlled humidities. R. C. D.

Rowley (H. H.) & Stuckey (J. E.). *Preparation and properties of calcium monofluorophosphate dihydrate.* Journ. Amer. Chem. Soc., 1956, **78** (3), 4262–4263, 2 figs.

Calcium monofluorophosphate dihydrate ($CaPO_3F.2H_2O$) was prepared as a white crystalline solid by the precipitation method using calcium chloride and sodium monofluorophosphate solutions. The dihydrate has both parallel and inclined extinction (33°–37°) and is considered to be monoclinic. It forms twinned crystals and exhibits marked similarly in properties to $CaSO_4.2H_2O$. Partial dehydration of the dihydrate to the hemihydrate was accomplished by heating samples in a vacuum desiccator over P_2O_5 at 65°C. The hemihydrate crystals were light brown in color and appeared to be pseudomorphous with the dihydrate. Hydration studies indicate a monohydrate-hemihydrate equilibrium to be stable at room temperature below 3·5 mm of H_2O vapor. R. C. D.

Hawley (J. E.) & Haw (V. A.). *Intergrowths of pentlandite and pyrrhotite.* Econ. Geol., 1957, **52**, 132–139, 12 figs.

Heat treatment at 800°C of synthetic $(Fe,Ni)_{1-x}S$ homogeneous solid solutions with varying Ni : Fe ratios, accompanied by loss of sulphur, gives rise to orientated blebs, stringers, flames, and even 'veins' of pentlandite in pyrrhotite which resemble in many ways various natural occurrences of these minerals. These segregations are attributed to exsolution following loss or readjustment of sulphur between pyrrhotite and pentlandite. 'Veins' of pentlandite are thus not necessarily due to crystallization from a liquid of this composition. [M.A. **9**–89] R. A. H.

Henderson (T. A.). *The oxidation rates of copper-iron sulphides.* Trans. Inst. Mining & Metall., London, 1958, **67**, 437–462, 15 figs.

In addition to work on synthetic sulphides, the oxidation rates of pyrite, chalcopyrite, bornite, and chalcocite were

measured. Chalcocite gave layers of both Cu_2O and CuO, chalcopyrite decrepitated at temperatures above about 550°C, and at such temperatures pyrite partially fused and oxidized to friable Fe_2O_3. R. A. H.

Eugster (H. P.). *Heterogeneous reactions involving oxidation and reduction at high pressures and temperatures.* Journ. Chem. Physics, 1957, **26**, 1760–1761, 1 fig.

A technique of using platinum as a semi-permeable container is described for carrying out experiments involving oxidation and reduction at high pressures (up to 2000 bars) and temperatures in the range 500°C to 900°C. The sample (in this investigation, silicates) together with water is held in a sealed platinum tube which is contained in a gold tube also sealed, the space between the two tubes being filled with a buffer+water. Oxides of iron and Fe_2SiO_4 have been used as buffers. Hydrogen formed by the dissociation of water is able to penetrate through the platinum tube and equalize the P_{O_2} between the buffer and the charge. An isobaric section (2000 bars total pressure) of the stability field of ferrous biotite ($KFe_3^{2+}AlSi_3O_{10}(OH)_2$) at partial pressures of oxygen from 10^{-26} to 10^{-16} bars is presented. W. S. M.

Lepp (H.). *Stages in the oxidation of magnetite.* Amer. Min., 1957, **42**, 679–681.

Chemical, d.t.a., and X-ray powder photograph data lead the author to propose that magnetite goes through three stages during rapid oxidation: (1) $4Fe_3O_4+O_2 \rightarrow 6\gamma Fe_2O_3$ commencing at 200°C, culminating at about 375°–400°C; (2) $\gamma Fe_2O_3 \rightarrow \alpha Fe_2O_3$ starting at about 375°C and probably ending at from 525° to 550°C; (3) $4Fe_3O_4+O_2 \rightarrow 6\alpha Fe_2O_3$ starting at from 550° to 575°C, culmination and point of completion dependent on the extent of reaction (1). Rate of oxidation is important, rapid oxidation favouring the formation of γFe_2O_3. At a given temperature and O_2 pressure it is a function of the specific surface of the material and the degree of perfection of the crystal lattice. G. D. N.

Weisz (R. S.). *Oxidation of manganese ferrite.* Journ. Amer. Ceram. Soc., 1957, **40**, 139–142, 4 figs.

The oxidation of manganese ferrite ($MnFe_2O_4$) in air between 750 and 1150°C is studied. Between 1050° and 1150°C a homogeneous oxidation occurs which results in a defect-type spinel which contains up to 10% Mn^{3+}. At 1050°C and below, bixbyite (Mn_2O_3) and hematite are formed. P. K. H.

Kedesdy (H.) & Tauber (A.). *Synthesis of some ferrites.* Journ. Metals, 1957, **9**, 1140–1148, 3 tables, 15 figs.

This article discusses the synthesis of ferromagnetic oxides such as Ni ferrite, Ni-Zn ferrite, and Mn ferrite. Trends in magnetic characteristics as related to change in firing cycle and furnace atmosphere are noted. Magnetic data are summarized for the three types of ferrites prepared under the most favourable conditions. R. G. Wls.

Van Hook (H. J.) & Keith (M. L.). *The system Fe_3O_4–Mn_3O_4.* Amer. Min., 1958, **43**, 69–83, 3 figs.

Investigation of the system Fe_3O_4–Mn_3O_4 was carried out on mixtures prepared in evacuated silica glass tubes to ensure the desired stoichiometric proportions. Runs at liquidus temperatures were made on prepared charges sealed in platinum tubes. Sub-solidus relations were determined mainly by X-ray diffraction studies on mixtures which had been heated to between 400° and 1100°C under conditions which permitted the synthesis and stable co-existence of the cubic and tetragonal phases. The liquidus exhibits a minimum at 67% Mn_3O_4 and 1543°C. Complete solid solution exists between Fe_3O_4 and Mn_3O_4 above the temperature of the tetragonal to cubic inversion of Mn_3O_4, that is above 1160°C. Below that temperature there is an immiscibility gap which increases in width at lower temperatures and is consistent with the compositions of the hausmannite and manganiferous magnetite found together in natural intergrowths. A. P.

Baldwin (B. G.). *The formation and decomposition of hercynite ($FeO.Al_2O_3$).* Journ. Iron Steel Research Inst., 1955, **179**, 142–146, 2 figs., 1 pl.

An investigation of the rate of formation of hercynite from mixtures of FeO and Al_2O_3 at temperatures of from 800° to 1300°C and the effect of the addition of CaO, MgO, SiO_2, and dolomite on the formation of hercynite has been carried out. The synthetic pure hercynite had a 8·143 kX but when 30% MgO was added to the mixture this was reduced to a 8·113 kX, presumably due to the formation of a solid solution between hercynite and spinel. Experiments were also made using different grain sizes and using either α- or γ-Al_2O_3. R. A. H.

Akimoto (S.), Nagata (T.), & Katsura (T.). *The $TiFe_2O_5$–Ti_2FeO_5 solid solution series.* Nature, 1957, **179**, 37–38, 2 figs.

A new solid solution has been found in the FeO–Fe_2O_3–TiO_2 system. Six members of the series connecting $TiFe_2O_5$ and Ti_2FeO_5 were synthesized at 1150°C. X-ray diffraction showed that each specimen was a single phase, having the same orthorhombic structure as $TiFe_2O_5$ (pseudobrookite). Cell parameters increase from 9·767, 9·947, 3·717 to 9·798, 10·041, 3·741 with increase of Ti. Five of the specimens were paramagnetic, one weakly ferromagnetic, possibly due to contamination. C. J. E. K.

ANDERNA (A. W.), RAMACHANDRA RAO (C. N.), & HONIG (J. M.). *The anatase-rutile transition. Part* 1. *Kinetics of the transformation of pure anatase.* Trans. Faraday Soc., 1958, **54**, 1069–1073.

Spectroscopically pure anatase, prepared by the oxidation titanium metal in an ammoniacal solution of 90% H_2O_2, s heated and its conversion to rutile investigated by X-ray wder diffraction methods. Below 610°C the transition is measurably slow ; above 730°C it occurs very rapidly. e conversion is second-order with respect to the remaining atase and is characterized by an activation energy of prox. 100 kcal/mole. R. A. H.

HAIRER (J. F.). *Melting relations of the common rock-forming oxides.* Journ. Amer. Ceram. Soc., 1957, **40**, 215–235, 41 figs.

A comprehensive summary of the most important phase-uilibrium studies of unary, binary, ternary, quaternary, d portions of quinary systems of the common rock-rming oxides—SiO_2, Al_2O_3, FeO, Fe_2O_3, CaO, MgO, Na_2O, d K_2O. P. K. H.

OOD (H.) & KNAPP (W. J.). *Stability of the aluminum silicates.* Journ. Amer. Ceram. Soc., 1957, **40**, 206–208, 1 fig.

Ternary phase diagrams of Al_2O_3–SiO_2 with CaO, MgO or eO show that free energies of formation of kyanite, andalu-te, and sillimanite, according to the reaction $Al_2O_3+SiO_2=l_2O_3.SiO_2$, are about 0 to 10 kcal rather than the previously ccepted value of −40 to −45 kcal. P. K. H.

OHNSTON (W. D.) & HEIKES (R. R.). *A study of the* $Li_xMn_{(1-x)}O$ *system.* Journ. Amer. Chem. Soc., 1956, **78** (3), 3255–3260, 6 figs.

For the composition range $0<x<0{\cdot}35$ in the formula $i_xMn_{(1-x)}O$ single phase products were obtained by eacting Li_2O_2 and MnO in sealed containers and quenching. his compound has the NaCl type structure with the X-ray ttice parameter increasing monotonically with increasing i content and a positive deviation from Vegard's law. $iMnO_2$ X-ray data were indexed on an orthorhombic unit ell with two formula weights of $LiMnO_2$ per unit cell $=2{\cdot}811_7$, $b=5{\cdot}763_4$, $c=4{\cdot}579_6$Å) ; sp. gr. (experim.) 4·23, alc.) 4·20. A partial phase diagram for the $Li_xMn_{(1-x)}O$ ystem and X-ray data for the phases are given. Small gions of solid solution about $LiMnO_2$ and Li_2MnO_3 are dicated. Magnetic studies are summarized in plots of agnetic susceptibility to temperature, Curie constant to mposition, and Θ to composition. The data obey the urie-Weiss law $X=C/(T-\Theta)$. The antiferromagnetic teraction is dominant in all compounds measured. R. C. D.

ROBBINS (C. R.) & LEVIN (E. M.). *The system magnesium oxide–germanium dioxide.* Amer. Journ. Sci., 1959, **257**, 63–70.

The equilibrium diagram for the system shows fields of stability for crystals having structures analogous to clino-enstatite, enstatite, olivine, quartz, rutile, a hexagonal phase $4MgO.GeO_2$, periclase, and spinel. Physical data (only partly new) for these are quoted as follows : A, hexagonal, $4MgO.GeO_2$; B (*spinel*) $2MgO.GeO_2$; C (*olivine*) $2MgO.GeO_2$; D (*enstatite*), $MgO.GeO_2$; E (*?clinoenstatite*), $MgO.GeO_2$:

	a	*b*	*c*	*α*	*β*	*γ*
A	11·773	—	14·448	1·740	?	1·755
B	8·255	—	—	—	1·76	—
C	4·915	10·295	6·020	1·698	1·717	1·765
D	18·661	8·954	5·346	1·741	1·755	1·759
E	—	—	—	1·757	—	1·790

H. W.

DACHILLE (F.) & ROY (R.). *The spinel-olivine inversion in* Mg_2GeO_4. Nature, 1959, **183**, 1257.

The inverse spinel Mg_2GeO_4 has been synthesized from the corresponding olivine using high-pressure water as a catalyst. Data on this inversion are summarized, and a more detailed account will be published later elsewhere. C. H. K.

TAUBER (A.), BANKS (E.), & KEDESDY (H.). *Synthesis of germanate garnets.* Acta Cryst., 1958, **11**, 893–894.

The germanium equivalents (Ge replacing Si) of uvarovite, andradite, grossular, spessartine, and calderite, and four germanate garnets with no natural analogues, have all been synthesized. J. Z.

[PLYUSHCHEV (V. E.] Плющев (В. Е.). Высокотемпературный синтез поллуцита. [*High-temperature synthesis of pollucite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 152–156.

The synthesis of $Cs[AlSi_2O_6]$ was effected by the sintering of β-spodumene + Cs_2SO_4 and leaching the mass with water. The sintering was done at 850°, 950°, and 1000°C and using different proportions of the components. It was possible to obtain a homogeneous residue of composition of $Cs[AlSi_2O_6]$ having a refractive index 1·514. The X-ray analysis gave *a* 13·646 kX, and the data agreed well with those for natural pollucite. S. I. T.

HAYEK (E.), BÖHLER (W.), LECHLEITNER (J.), & PETTER (H.). *Hydrothermalsynthese von Calcium-Apatiten.* Zeits. anorg. Chem., 1958, **295**, 241–246.

Crystalline hydroxyapatite can be prepared by hydrothermal synthesis at 400°C in the range of pH 5 to 11.

With the exception of $CaHPO_4$ which is formed in addition to apatite, at a pH of 4·5 no other calcium phosphate occurs. Complete substitution of OH by F can be achieved in the presence of KF. The crystallization of apatite is disturbed by CO_3 ions; there is however no entry of carbonate ions into the apatite lattice. R. A. H.

Hlaváč (Jan). *Příspěvek k fázovému diagramu soustavy SiO_2–Al_2O_3–MgO–CaO(–Na_2O) v oblasti kvarterního eutektika tridymit-wollastonit-anorthit-diopsid.* [Contribution to the phase-diagram of the system SiO_2–Al_2O_3–MgO–CaO(–Na_2O) in the region of the quaternary eutectic tridymite-wollastonite-anorthite-diopside]. Sborník prací z technologie silikátů, 1955, **2**, 207–217, 12 figs.

This quaternary eutectic, melting point 1160°±10°C, has the composition SiO_2 59·5, Al_2O_3 14·2, MgO 2·5, CaO 23·8. [M.A. **13**–191] F. S.

Roy (D. M.). *Studies in the system CaO–Al_2O_3–SiO_2–H... IV; Phase equilibria in the high-lime portion of ... system CaO–SiO_2–H_2O.* Amer. Min., 1958, **43**, 10... 1028, 3 figs., 5 tables.

Phase equilibria were determined by hydrother... quenching techniques. Three phases, previously unide... fied and called *X*, *Y*, and *Z*, have the probable compositi... $8CaO.3SiO_2.3H_2O$, $6CaO.3SiO_2.H_2O$, and $9CaO.6SiO_2.H$... respectively. In general they are stable to temperatu... above 800°C in the pressure range from 2000 to 15,0... lb/in². Composition *X* is apparently a calcium analog... of chondrodite; attempts to synthesize MgO–SiO_2–H... system members of the chondrodite series, for comparis... were mostly unsuccessful. Eleven X-ray diffracti... patterns (four are of different rankinite samples) and fo... infra-red absorption spectra (using the KBr method) a... presented. Some optical properties are also given. Applic... tions of the results are briefly discussed relative to ceme... materials and natural mineral associations. B. H. B.

GEMSTONES

Bundy (F. P.), Hall (H. T.), Strong (H. M.), & Wentorf, (R. H., *Jr.*). *Man-made diamonds.* Nature, 1955, **176**, 51–55, 5 figs.

The synthesis of diamonds has been achieved by developing equipment capable of holding pressures and temperatures in the diamond-stable region for hours at a time. Proof that diamonds were made was based on the following tests—X-ray diffraction patterns, chemical analysis to show the crystals were composed of carbon, hardness tests, repeatability of the synthesis, and measurement of the index of refraction. [M.M. **32**–185] D. J. S.

[Nardov (V. V.)] Нардов (В. В.). Фотограммы кристаллов алмаза, протравленных в расплаве кимберлита. [*Photograms of diamond crystals etched in a kimberlite melt.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (5), 612–614, 12 figs.

Octahedra of diamond subjected to the action of molten kimberlite are gradually transformed into rounded trigonotrioctahedra, rounded rhombdodecahedra with ribs along the longer diagonal of the rhombic faces. The present work consists of the comparative study of light pictures (photograms) of artificially etched, naturally etched, and unetched octahedra of diamond, as well as the study of the etch pits on the faces of diamond. S. I. T.

[Kvokov (K. G.)] Квоков (К. Г.). Дисковая скульптура на алмазах и ее происхождение. [*The disc relief on diamonds and its origin.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 240–246, 17 figs.

Certain diamond crystals from Soviet localities have ... their faces a peculiar disc-like and step-like outgrowt... photographs and descriptions of which are given. T... possible mode of formation is discussed and it is suggest... that the pulsational process of growth of the discs w... conditioned by the presence of a liquid carbon phase ... the magma in which these diamond crystals were gro... ing. S. I. T.

Owens (George W.). *Crater of diamonds, Murfreesbo... Arkansas.* Rocks and Minerals, 1958, **33**, 3–6, 4 figs.

A popular account is given of the present status of th... American diamond-bearing kimberlite deposit. Collecto... may visit the deposit for a small fee. A royalty of 25% ... the appraised value is charged for each diamond foun... weighing over 5 carats. Recently a stone of over 16 cara... was found. Statistics concerning diamonds from the are... are summarized. R. S. M.

Custers (J. F. H.) & Raal (F. A.). *Fundamental absorp... tion edge of diamond.* Nature, 1957, **179**, 268–269, 2 fig... C. J. E. K.

Brill (R.) & Zandy (H.). *Absolute measurement of th... intensity of the* (111) *reflexion for diamond.* Natur... 1959, **183**, 1387.

A re-determination of the absolute intensity of the 11... reflexion gives a value for the atomic scattering factor ... carbon which agrees with McWeeney's theoretical valu... [Acta Cryst. **4**–513] C. H. K.

)LPHIN (G. W.) & STRATTON (K.). *Electron bombardment of counting diamonds.* Proc. Roy. Soc. London, 1958, **244**, **A**, 424–436, 5 figs.

Electron bombardment (13·5 MeV) of diamond counters ves rise to a random distribution of vacant sites and inter- tial carbon atoms. Preferential damage is thought to cur in the vicinity of intrinsic textural defects, especially rrier layers of vacant sites. Additional disorder is pro- ced by rise in temperature along the path of bombarding rticles leading to partial graphitization. Diamonds come bluish-green after exposure to bombardment ixes of 4×10^{16} electrons/cm^2. D. McK.

YER (H. B.) & MATTHEWS (I. G.). *The fluorescence of diamond.* Proc. Roy. Soc. London, 1958, **243**, **A**, 320–335, 7 figs.

Apparatus for both the photographic and photoelectric cording of the fluorescence excited by the 3650Å group mercury lines has been developed. Type I diamonds hibit three emission systems, at 4150Å, 5032Å, and 195Å, type IIa at 4150Å and 5032Å only ; no fluorescence as observed in type IIb. The fluorescence spectra are mpared with the corresponding absorption spectra. The fect of irradiation and of subsequent heat treatment are escribed. Various interpretations of the nature of the ntres responsible for the fluorescence are discussed. D. McK.

AIT (ALICE S.). *Asterism in corundum.* Journ. Gemmology, 1955, **5**, 65–72.

Microscopic examination of thin sections of corundum rystals displaying asterism revealed fine, rod-like inclusions ring parallel to the faces of the hexagonal prism. These howed a red-brown colour by transmitted light and had a quare cross-section. Spectrographic analysis supported he opinion that these inclusions were rutile. In stones howing a 12-pointed star inclusions were seen lying parallel ot only to the first-order but also to the second-order exagonal prism. B. W. A.

UGAND (S.) & TANABE (Y.). *The line spectra of Cr^{3+} ion in crystals.* Disc. Faraday Soc., 1958, no. 26, 43–48.

Assignments are made for two prominent characteristic loublets in the absorption spectrum of Al_2O_3 containing Cr^{3+} as impurity (ruby). Difficulties arising in an analogous nterpretation of the similar spectrum of Cr-alum are liscussed. J. M. H.

NAUTIYAL (S. P.) & MUKHERJEE (B.). *Absorption spectrum and colour of blue sapphire.* Gemmologist, 1958, **28**, 119–121.

Two absorption bands in blue sapphire in the ultra-violet are at 3750 and 3880Å. These findings have been previously recorded by other workers and criticisms made do not agree with original texts. G. F. A.

BROWN (J. COGGIN). *Sapphires of Burma.* Gemmologist, 1958, **27**, 24–27 & 41–44.

A survey of the occurrence and recovery of sapphires found in Burma, with some notes on the mining of sapphires from Siam and Cambodia. The chief mining centres for Burma sapphires are at Kathe, Kyanugdwin, and Gwebin. G. F. A.

PRYCE (M. H. L.) & RUNCIMAN (W. A.). *The absorption spectrum of vanadium corundum.* Disc. Faraday Soc., 1958, no. 26, 34–42.

High-resolution measurements of absorption by a crystal of corundum containing vanadium as impurity (alexandrite-type synthetic sapphire) in the wavelength range 0·4–1·2 microns were made at three low temperatures. The results are discussed in relation to the electronic origin of the spectrum. J. M. H.

ANDERSON (B. W.). *Properties and classification of individual garnets.* Journ. Gemmology, 1959, **7**, 1–7.

The optical and other physical properties of the various minerals in the garnet group are reviewed and hints are given for their distinction from each other and from the spinels. The analysis, by Johnson, Matthey & Co., of a garnet from Brazil occurring in large irregular dodecahedral crystals, with sp. gr. 4·245, n 1·815,, gave SiO_2 35·02, Al_2O_3 21·22, FeO 23·12, MnO 18·92, CaO 0·57, MgO nil, 'oxygen & loss' 1·15,=100·00 : this is equivalent to almandine 53%, spessartine 44%, grossular 1·5% and for such material the name *spessandine* is suggested. [M.A. **13**–537] R. A. H.

ALLEN (FRED M., *Jr.*). *Hiddenite, a North Carolina gem stone.* Rocks and Minerals, 1958, **33**, 310–311, 1 fig.

A brief history is given of the discovery and development of the hiddenite deposits 12 miles west of Statesville, North Carolina. R. S. M.

RUFF (ELSIE). *Jade story—American.* Journ. Gemmology, 1959, **7**, 18–31, 3 photos.

An historical account is given of chalchihuitl or Mexican jade together with a review of various ancient and modern texts dealing with this material. [M.A. **14**–40] R. A. H.

EHRMANN (M. L.). *A new look in jade.* Gems & Gemology, 1958, **9**, 134–135 & 158.

A detailed description with colour formula of one method

in use today for dyeing inferior jade. A second dyestuff is mentioned. The structure of an effective jade triplet is described. J. A. H.

Perez (Rafael). *Trip to lapis lazuli locality at Ovalle, Chile.* Rocks and Minerals, 1958, **33**, 387–393, 7 figs.

In the Andes, near Ovalle, Chile, lapis lazuli is found along the contact zone of granite with limestone. About 50 pounds of dark blue lapis lazuli, containing specks of pyrite, were collected on the expedition, which is described in detail. R. S. M.

Sinclair (W. E.). *The Kliphuis crocidolite deposits.* Trans. Inst. Mining & Metall., London, 1957, **66**, 69–78, 4 figs., 1 pl.

An outline is given of the geology of the crocidolite seams which occur in the banded ironstone of the Lower Griquatown series of the Transvaal System on the Orange River, about seven miles NNW of Prieska, Cape Province. Chem. anal. : typical fine blue fibrous crocidolite, anal. H. E Vasser, SiO_2 51·94, Al_2O_3 0·20, Fe_2O_3 18·64, FeO 19·39, MgO 1·37, CaO 0·19, Na_2O 6·07, K_2O 0·04, H_2O+ 2·89, = 100·73 ; incipient or 'potential' crocidolite, SiO_2 50·71, Al_2O_3 0·00, Fe_2O_3 20·45, FeO 17·41, MgO 2·28, CaO 0·15, Na_2O 5·75, K_2O 0·07, H_2O+ 3·46, = 100·28. The latter occurs as dark blue-green seams representing recrystallized sediments. R. A. H.

[Eremeev (V. P.)] Еремеев (В. П.). Агальматолит Тувы. [*Agalmatolite of Tuva.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr., Min. Geochem.], 1957, **17**, 23–33, 7 figs.

Since early times Tuva agalmatolite has been used as a material for carving objets d'art. The deposits are situated on the mountain Sarykh-Khaya, in western Tuva [southern Siberia]. They occur as lenses among quartzites of Upper Silurian or Lower Devonian age, and the agalmatolite is believed to be a product of metasomatic replacement of aluminium-containing rocks, connected with the intrusive granite. There are two varieties of agalmatolite-rock, a dickite-rock, and a diaspore-rock, for which chem. ana d.t.a., and X-ray data are given. S. I. T.

Webster (Robert). *Marbles and other ornamental ston* Journ. Gemmology, 1958, **6**, 297–333, 19 figs.

An account of the nature and origin of various types marble including also a discussion on ornamental variet of limestone, alabaster, porphyry, serpentine, quartzi malachite, verdite (a massive muscovite rock colour green by fuchsite), lapis lazuli, sodalite, rhodonite, rhod chrosite, thulite, fluorite, lepidolite, and feldspar (avent rine, labradorite, and peristerite). R. A. H.

Eppler (W. F.). *The origin of healing fissures in gemstone* Journ. Gemmology, 1959, **7**, 40–66, 45 photos.

Healing fissures are tentatively classified according whether they originated by rapid growth of the host cryst by incipient cleavage, by primary crystal inclusions whi cause cleavage cracks or tension cracks, or by shear tensi cracks in the host crystal. Details and illustrations a given of healing fissures in quartz, topaz, scapolite, fluorit andalusite, orthoclase, spinel, tourmaline, beryl, zircon, a garnet and an explanation of the origin of the more or le healed cracks has been attempted in each case. R. A. H.

Braun (Vernon R.). *Gem collecting in Montana.* Roc and Minerals, 1958, **33**, 12–14.

Brief accounts of localities in western Montana yieldi the following minerals : sapphire, quartz crystals (clea smoky, amethyst), wood opal, steatite, asbestos, idocras staurolite, agatized wood and jasper. R. S. M.

Bruce (George A.). *Gemstones of North Carolina.* Roc and Minerals, 1958, **33**, 308–309.

Brief summaries of the discovery and occurrence diamond, ruby, sapphires, hiddenite, beryl, &c., are give R. S. M.

Webster (R.). *Imitation pearls—their manufacture an properties.* Gems and Gemology, 1958, **9**, 144–147.

Current manufacturing techniques and diagnostic feature are given. J. A. H.

GEOCHEMISTRY

[Vinogradov (A. P.)] Виноградов (А. П.). Геохимия редких и рассеянных химических элементов в почвах. [*Geochemistry of rare and dispersed chemical elements in soils.*] Изд. Акад. Наук СССР. [Publ. Acad. Sci., U.S.S.R.], Moscow, 1957, 235 pp., 10 figs. Price 15 r. 70 k.

This is a second and enlarged edition of a book first published in 1949. It was V. I. Vernadsky who in 1911 began to study soils from a geochemical point of view. The present author, with many collaborators, followed up thi work, and this book, representing a summary of the result achieved, must therefore be of great importance both t pedologists and to geochemists. After a brief account of th distribution of the chemical elements, the principal geo chemical processes, and the types of soils in Russia, a detaile account is presented of the distribution and content o some fifty chemical elements in soils of the whole world supported by much numerical data and sixteen pages o

ences. In a brief concluding chapter the author gives average distribution of chemical elements in various s and soils and notes certain regularities in such a dis- ition. S. I. T.

EPUM (J. R.). *Limestone analyses and complete analyses of rocks carried out in* 1955. Rec. Geol. Surv. Tanganyika, 1958, **5**, 96–99.

artial analyses of 164 sedimentary and metamorphic stones are recorded. Complete chemical analyses are n, without petrographic description, for 8 rocks which ude metagabbro, metamorphosed ultrabasic rock, ine-gabbro, 3 from the Rungwe Volcanics (phonolitic hyte, camptonite, biotite-syenite), and 2 from Oldoinyo gai (melanephelinite, quartz-bostonite). D. McK.

EPUM (J. R.). *Complete analyses of rocks carried out in* 1956. Rec. Geol. Surv. Tanganyika, 1958, **6**, 94–100.

ifty-seven complete rock analyses, by W. H. Herdsman, placed on record without petrographic description. alysed rocks include talc-[yoderite]-kyanite-quartz schist, montite-quartz schist, fuchsite-quartzite, 7 from the guru meta-anorthosite complex, eclogite, 3 zoisite- undum-amphibole rocks (Tanganyika Artstone) from kerstein, metagabbro, olivine-hyperite, granite, syenite, nblende-diorite, quartz-syenite, 7 Bukoban dolerites, rroo dolerite, 2 kimberlites, orthoclase-rock and tephrite m Musensi carbonatite, 4 alkaline lavas from the Rungwe canics, 6 lavas and a tuff from the Neogene of Northern ovince, and 13 lavas from Kilimanjaro. D. McK.

UKOV (A. A.)] Сауков (А. А.). О геохимических работах А. Е. Ферсмана. [*On the geochemical works of A. E. Fersman.*] Вопросы геохимии и минералогии, Акад. Наук СССР. [Problems of Geochemistry and Mineralogy, Acad. Sci. U.S.S.R.], 1956, 9–18. S. I. T.

HAFRANOVSKY (I. I.)] Шафрановский (И. И.). Минерагенетическая кристаллография в трудах А. Е. Ферсмана. [*Mineral-genetic crystallography in the works of A. E. Fersman.*] Вопросы геохимии и минералогии, Акад. Наук СССР. [Probl. Geochem. & Min., Acad. Sci. U.S.S.R.], 1956, 19–23. S. I. T.

HCHERBINA (V. V.)] Щербина (В. В.). Формы переноса химических элементов в процессах минералообразования и условия их концентрации. [*The forms of transfer of chemical elements in the processes of mineral formation, and conditions of their concentration.*] Вопросы геохимии и минералогии, Акад. Наук СССР. [Probl. Geochem. & Min., Acad. Sci. U.S.S.R.], 1956, 72–82. S. I. T.

[VLASOV (K. A.)] Власов (К. А.). Эманационный процесс и кристаллизационная дифференция как ведущие факторы образования ряда месторождений редких элементов. [*The emanational process and crystallization differentiation as the leading factors in the formation of a series of deposits of rare elements.*] Вопросы геохимии и минералогии, Акад. Наук СССР. [Probl. Geochem. & Min., Acad. Sci. U.S.S.R.], 1956, 83–93. S. I. T.

[GINZBURG (I. V.)] Гинзбург (И. В.). Об одном примере генетической связи редкометальных пегматитов с гранитными породами. [*An example of the genetic connection of rare-elements pegmatites with granite rocks.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petrography, Mineralogy and Geochemistry], 1957, no. 5, 164–192.

Granite intrusions, with their accompanying pegmatites, of different ages and within a certain region of Kola Peninsula, are described, and a detailed account is given of the constituent minerals. Chemical, modal, and spectroscopic analyses serve as a basis for geochemical generalizations, such as the distribution of elements in the granites and in the pegmatites, and the genetic relation between these two sets of rocks. S. I. T.

[PLAMENEVSKAYA (N. L.)] Пламеневская (Н. Л.). Геохимическое исследование малых элементов в породах Майкульской гранитной интрузии. [*A geochemical study of trace elements in the rocks of the Maikul granite intrusion.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, no. 5, 193–212, 7 figs.

This is a petrochemical study of a granite complex of Maikul in Central Kazakhstan. The trace elements studied by spectrographic methods were determined for the successive phases of the intrusive rocks, aplite-pegmatites, and quartz and ore veins. The distribution of the trace elements is discussed in detail and a number of conclusions bearing on the geochemistry of the complex are drawn. A detailed genetic history of the complex is given, including the processes of greisenization and ore-formation. S. I. T.

[BELYANKINA (E. D.)] Белянкина (Е. Д.). Некоторые данные по спектроскопическому изучению пород и минералов слюдоносных пегматитов. [*Certain data on the spectroscopic study of rocks and minerals of mica-bearing pegmatites.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.]. 1957, no. 10, 57–72, 9 figs.

This is an extensive spectro-analytical study, involving 35 elements, of mica pegmatites from Kola Peninsula, Karelia, and eastern Siberia. The distribution of the elements in rocks and minerals is discussed. It is concluded, among other things, that although the intrusion of pegmatites was accompanied by remelt and assimilation of country rocks, the elemental composition of pegmatites and that of country rocks are distinct. S. I. T.

Raguin (Eugène). *Sur la géochimie des gisements métallifères.* K. Nederl. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H. A. Brouwer), 319–329.

The effect of the distinction of lithophile, siderophile, and chalcophile elements on the classification of metalliferous deposits is examined. A possible metallogenic interaction between mantle and crust is discussed and the problem of the origin of the metalliferous concentrations is considered. R. A. H.

[Shabynin (L. I.)] Шабынин (Л. И.). О закономерностях размещения и условиях образования концентраций бора в эндогенных боратах скарновых месторождений. [*On the laws governing the distribution and formation of conditions of boron concentrations in endogenetic borates of skarn deposits.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Sér. Géol.], 1959, **3**, 81–90.

A tabular review is given of world endogenetic skarn borate deposits. The relations between the nature of the deposit, the tectonic environment, the age, and the nature of the invading and of the country rock, are traced and certain geochemical and prospecting generalizations are drawn. S. I. T.

El Shazly (E. M.), Webb (J. S.), & Williams (David). *Trace elements in sphalerite, galena and associated minerals from the British Isles.* Trans. Inst. Mining & Metall., London, 1957, **66**, 241–271, 4 figs., 8 tabs.

Results are given of the quantitative spectrographic determination of trace elements in 69 specimens of sphalerite and 83 of galena from a wide range of localities mostly in Britain. Both epigenetic and syngenetic varieties were studied and their trace element assemblages are compared. Attention is drawn to the correlation between the concentration of certain trace elements and the class of hydrothermal deposit in which these sulphides occur : in Devon and Cornwall the distribution of trace elements apparently susceptible to temperature control in sphalerite and galena may follow a zonal arrangement around the granite masses. Associated minerals whose trace element contents have been determined include chalcopyrite, pyrite, marcasite, tetrahedrite, and bournonite, together with oxidized lead and zinc minerals and the gangue minerals, calcite, fluorite, and baryte. R. A. H.

Young (R. S.). *The geochemistry of cobalt.* Geoc Cosmochim. Acta, 1957, **13**, 28–41.

A review. J. R.

Wager (L. R.), Smit (J. van R.), & Irving (H.). *Inc content of rocks and minerals from the Skaerg intrusion, East Greenland.* Geochim. Cosmochim. A 1958, **13**, 81–86, 1 fig.

The concentration of In increases with successive diffe tiation from 0·06 p.p.m. in hypersthene olivine gabbr 0·18 p.p.m. in fayalite ferrogabbro ; for the latest roc granophyre, the In content is intermediate at 0·091 p. Fe-rich low temperature pyroxenes contain more In t Mg-rich high temperature pyroxenes. In hortonolite fe gabbro, ilmenite (5·5 wt % of the rock), magnetite (4·5 and pyroxene (23%) contain respectively 0·29, 0·16 0·18 p.p.m. In. Olivine (13%) and plagioclase (5· contain 0·056 and 0·0032 p.p.m. In. Fayalite ferrogab with 2% sulphides contained scarcely more In tha sulphide-free fayalite ferrograbbro. In does not here sh strong chalcophile tendencies. In was determined by ra activation analysis. [M.A. **11**–557, **13**–570] J. R. H

[Borisenko (L. F.)] Борисенко (Л. Ф.). Скандий месторождениях различных генетических тип [*Scandium in deposits of different genetic types.*] И Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S. Sér. Géol.], 1959, **4**, 53–60.

Besides the two scandium minerals thortveitite a bazzite, there are a number of minerals, such as cassiter wolframite, columbite, and others, which may cont small amounts of scandium. In this paper the aut gives a review of all types of scandium deposits, endogene (pegmatites and pneumatolitic-hydrothermal, includ skarns and carbonatites) and exogenetic (placers and se mentary). S. I. T

[Ivanov (V. V.), Borisenko (L. F.), & Lizunov (N. V Иванов (В. В.), Борисенко (Л. Ф.) и Лизунов (Н. В Скандий в минералах кварцевых жил и грейзенов одн из интрузий хр. Полоусного. [*Scandium in the minerals the quartz veins and greisens of one of the intrusions of Polousny range.*] Доклады Акад. Наук СССР. [C. Acad. Sci. U.S.S.R.], 1959, **125**, 608–610, 3 figs.

The percentage of Sc_2O_3 in the three minerals studi was as follows : wolframite (0·05–0·1), cassiterite (0·02–0· and zinnwaldite (0·005–0·05). Wolframite also contain approx. 0·2% Nb_2O_5 and 0·05% TiO_2. S. I. T.

El Wardani (Sayed A.). *On the geochemistry of germaniu* Geochim. Cosmochim. Acta, 1957, **13**, 5–19.

Ge in chondrites varies from 6·6 to 12·0 p.p.m. ar

rages 9·4 p.p.m.; Ge in iron meteorites varies from w 1 p.p.m. to 520 p.p.m. and shows a weak inverse tion to the Ni content. The Ge concentration range p.p.m. in granitic rocks and gabbros is, respectively, 1·5 and 0·8–1·5; in diabase and basalt 1·2-1·4. The rage Ge content of the earth's crust is taken as 1·0 m. compared with that of $1·5 \pm 0·5$ p.p.m. given by shi. The least-linked silicate minerals like olivine ain more Ge (1·6 and 2·1 p.p.m. Ge) than quartz p.p.m. for 4 samples and 0·9 p.p.m. for 1 sample). Ge rages about 2 p.p.m. in shales; exceptionally one non-ine montmorillonite of seven analysed showed 12 p.p.m. rmal spring waters are practically devoid of Ge and sea er contains but 5×10^{-5} p.p.m. Ge. J. R. B.

TT (R. C.) & BARKER (F. B.). *Radium and uranium in ground water of the United States.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 153–157, 1 table, 1 fig.

Data are given of Ra and U concentration in ground ers of ten geotectonic regions covering the United tes. The anomaly threshold is defined from a log-normal quency curve, and the use in geochemical prospecting of ratio of radio-element to total dissolved solids discussed. J. D. P.

RMANOV (A. I.), BATULIN (S. G.), VOLKOV (G. A.), LISITSIN (A. K.), & SEREBRENNIKOV (V. S.). *Some regularities of uranium distribution in underground waters.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 161–177, 4 tables, 18 figs.

Analyses of chemical composition and Eh for two types hydrogeochemical cross-section are considered. In bitu-nous rocks, strongly reducing conditions exist below the dation zone; waters in such conditions are low in U t high in Ra. Where there is no organic matter or sul-ides, waters at depth are enriched both in U and Ra. e influence of climate on hydrogeochemical background, l the effect of ore type on uranium content are examined. mposition of the salts in underground waters does not relate with uranium content. Three types of ore oxida-n in the zone above the permanent water table are tinguished according to sulphide content, and their value geochemical prospecting discussed. Data are given of emical composition of waters in different climatic and ological situations. J. D. P.

ALAY (A.). *The significance of humus in the geochemical enrichment of uranium.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 182–186, 6 figs.

Laboratory investigations show that peat can fix nearly 10% U at pH 6. The fixation is a cation exchange process, and U is leached from spiked samples at pH <3. Experiments with various cations show that the enrichment increases with valency and atomic weight, and that cations of higher valency and atomic weight expel those of lower atomic weight and valency. Peat with the humic acid extracted loses its U-fixing capacity. The chemical structure of humus and the fixation of U are briefly discussed, and comparison is made between natural enrichment and the experimental data. J. D. P.

VINE (J. D.), SWANSON (V. E.), & BELL (K. G.). *The role of humic acids in the geochemistry of uranium.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 187–191, 1 table, 2 figs.

Four types of carbonaceous matter are distinguished: indigenous humic matter, redeposited humic extracts, indigenous sapropelic matter, and redeposited bitumens. Only the first two are commonly associated with U deposits, and are responsible for the U concentrations in lignites and black shales. Characteristics of humic acids and related substances are discussed, and examples of humic acids and humates in sedimentary rocks given. Analysis of dried dopplerite from Wyoming shows, exclusive of ash, H 3·6, C 62·2, N 2·2, O 29·3, and S 2·7%. Spectrochemical analysis of the ash shows over 10% Na, 0·5–2% Mg, Ca, Al, and Fe, and lesser amounts of Si, B, Ti, Ni, Sr, Ba, Cr, Cu, V, Y, Zr, Mn, Co, Sc, Yb, Be, and Ga. J. D. P.

PIERCE (A. P.), MYTTON (J. W.), & BARNETT (P. R.). *Geochemistry of uranium in organic substances in petroliferous rocks.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 192–198, 1 table, 2 figs.

Chemical determinations of U, Th, Pb, C, H, N, O, and S, X-ray analyses, infra-red data, sp. gr. and refr. ind. are given for 27 samples of uranium-bearing carbonaceous mineraloids from 15 localities. These and other data suggest that the mineraloids formed from organic esters, acids, and related substances associated with petroleum; and that their original structure and compositions have been systematically altered because of radiation damage. J. D. P.

CHERVET (JEAN) & COULOMB (RENE). *Geochemical behaviour of uranium in the alteration cycle.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 199–203, 5 tables.

From laboratory investigation of soluble uranium complexes it is postulated that U in most natural waters is in the uranyl carbonate form and its circulation is controlled by the carbonate content of the water. High concentrations

of U in waters in active mine workings (up to 90 mg/litre) are explained by the acceleration of oxidation phenomena and increased circulation ; outside the deposits which are being worked U concentrations of 0·1 μg/litre–1 mg/litre are accepted as normal. The geochemistry of natural waters circulating over granite and the part played by soils, humus, and vegetation in the geochemistry of U are discussed. Examples are given of various phenomena which limit the circulation of U. J. D. P.

Shcherbina (V. V.). *Geochemistry of uranium in the oxidation zone of ore deposits on the basis of experimental study data.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 211–214, 1 fig.

Geochemical processes in the oxidation zone are reviewed with special reference to the effect of pH on the composition of secondary uranium minerals. Cation exchange in groups of uranophosphates, uranoarsenates, uranovanadates and uranosilicates in the presence of K^+, Cu^{2+}, Ca^{2+}, and Pb^{2+} is discussed in the light of experiments. Conclusions of field and physical and chemical investigations of paragenetic associations of uranium minerals in the hydrogenetic zones are presented. J. R. H.

Merill (J. R.), Honda (M.), & Arnold (J. R.). *Beryllium geochemistry and beryllium-10 age determination.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 251–254, 3 tables.

The suitability of ^{10}Be, with a half-life of about 2·5 m.y., as a possible species for age determination is discussed. Analyses of Pacific red-clay cores, using an absorption spectrophotometric method, show 2–3 p.p.m. Be. Pacific ocean water at 950 metres depth and surface water contain, respectively, 2·0–5·5 and $0{\cdot}7–2{\cdot}2 \times 10^{-4}$ mμg/kg of dissolved Be. Total Be contents were, respectively, 5·0–7·5 and $2{\cdot}2–3{\cdot}1 \times 10^{-4}$ mμg/kg. The results show that the residence times of Be in the ocean are short. Models for age measurements are discussed. M. J. G.

Pommer (Alfred M.). *Reduction of quinquevalent vanad solutions by wood and lignite.* Geochim. Cosmoc Acta, 1957, **13**, 20–27. J. R.

Goldberg (E. D.) & Arrhenius (G. O. S.). *Chemist Pacific pelagic sediments.* Geochim. Cosmochim. A 1958, **13**, 153–212, 10 figs., 1 pl.

About 10% of the Ni, Co, Cu, and Zn in sea water o as associated sulphates and most of the remaining Cu oc as Cu^{2+} hydrated or $CuCl^+$; Au, Ag, and Hg probably o as chloro complex anions $AgCl_2^-$, $HgCl_4^{2-}$ and $AuCl_4^-$ pelagic sediments the concentrations in dissolved sorbed phases (corresponding to the dialysate in the sys sediment : distilled water) are similar to those in sea w for Mg, K, and Ca. The concentrations of B and Si moderately enhanced with respect to sea water whe those of Al, Fe, Mn, and Cu are enhanced by factors of u 100 or more. Cr and Ba are up to 1000 times more con trated in the dialysate than in sea water and only S shown to be depleted in the dialysate (by a factor of 5– Sc, Ti, V, Co, Ni, Ga, Y, Zr, Mo, Ag, Ln, and Pb were detected in the dialysates. The concentrations in the t solid phases of pelagic sediments of Li, Na, Mg, Al, Si Ca, Ti, V, Ga, Sr, and Zr are close to or of the same o as those in igneous rocks. Variable Cr content is relate proximity to basaltic pyroclastics, and the following ments are usually more abundant in the solid phase pelagic than in igneous rocks. B is mostly strongly bon (i.e. not removed by a chelating agent like EDTA at neu pH) and substitutes for Si ; Sc, Y, Ln, and Th are sh to be principally concentrated in ferromanganese o minerals and can be removed by chelation ; Co, Ni, and concentrate with Mn in δ-MnO_2 and ferromanganese oxi and the role of δ-MnO_2 is described as that of a scaven of high charge density ions (from sea water). Mn concentrates with Co, Cu, Y, and Ln and, especially, Ag, and Pb in the colloidal fraction of pelagic sedime (when none of the elements is removable by chelati This paper is full of new analytical data and all the meth of analysis are described. J. R. B

HISTORY AND BIOGRAPHY

[Grigoriev (D. P.) & Kuznetzova (V. G.)] Григорьев (Д. П.) и Кузнецова (В. Г.). Новая экспозиция минералов в Горном Музее. [*A new display of minerals in the Mining Museum.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 69–75, 1 fig.

'Mining Museum', or the museum attached to the Mining Institute at Leningrad, was founded at the same time as the Institute itself in 1773. During its long existence its displays were recast many times to illustrate prevailing views on the classification of minerals. The new display is accordance with the requirements of a new course mineralogy, and the minerals are arranged into six divisi to illustrate the following aspects of minerals : (1) consti tion, (2) morphology, (3) properties, (4) genesis, (5) type occurrence, (6) practical use. Great use is made of la and detailed labels. The museum is visualized as a 'st book' in which minerals are induced to 'speak' for the selves. S. I. T

NON. *Dr. Leonard J. Spencer.* The Times, 16th April, 1959.

ITH (W. CAMPBELL). *Dr. L. J. Spencer, C.B.E., F.R.S.* Nature, 1959, **183**, 1564.

— *Leonard James Spencer.* Min. Mag., 1959, **32**, 181–184.

The first two articles are notices of the death (14th April, 959) and brief summaries of the career of Dr. L. J. Spencer, B.E., F.R.S. The third is of a more intimate biographical ature. Spencer was editor of the *Mineralogical Magazine* om 1901 to 1955 and of *Mineralogical Abstracts* from its ginning until 1955 [M.M. **31**–1]. He was born in 1870, ined the staff of the Department of Mineralogy, British useum (Natural History), in 1894 and retired in 1935. M.M. **29**–256]. He was an honorary member of the Minera- gical Society of Germany and honorary fellow and oebling medallist of the Mineralogical Society of America. A.M. **40**–688] J. Ph.

UTINA (JAN). *Memorial of František Slavík.* Amer. Min., 1958, **43**, 325–330.

LAZARENKO (E. K.)] Лазаренко (Е. К.). Академик Франтишек Славик [*Academician František Slavík*]. Мин. Сборник Львовского Геол. Общ. [Min. Mag. Lvov Geol. Soc.], 1957, **11**, 402–403.

NOVÁK (JIŘÍ). Akademík František Slavík zemřel [*Academician František Slavík died*]. Časopsis min. geol., Praha, 1957, **2**, 193–195.

SPENCER (L. J.). *František Slavík.* Proc. Geol. Soc. London, 1957, no. 1554, p. 139.

A selected bibliography of F. Slavík's papers is given in the article by J. Kutina, and a complete bibliography by J. Novák is contained in a special volume, *Almanac of Essays in honour of Academician František Slavík*, Ústředního ústavu geologického, Praha, Publ. House Czechoslovak Acad. Sci., 1957, 549 pp., price 48 Kčs. In addition to the papers cited an abbreviated biography was published on the occasion of Slavík's 80th birthday in *Časopsis pro mineralogii a geologii, Praha*, **1**, 1956, 193–195, in Russian and English. Slavík was a constant contributor of abstracts of Czechoslovakian literature to *Mineralogical Abstracts* from 1922 to 1957 and many by him have appeared posthumously up to and including the current number. [M.A. **14**–45] J. N.

[SOLOVIEV (S. P.)] Соловьев (С. П.). Памяти Р. Дэли — почетного члена Всесоюзного Минералогического Общества. [*In memoriam of R. A. Daly—honorary member of the Mineralogical Society of the U.S.S.R.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 81–85, 1 pl.

A brief appreciative account of the life and work of R. A. Daly (1871–1958). S. I. T.

MINERAL DATA

VESTLAND (A. D.) & BEAMISH (F. E.). *The chemical analysis of iridosmines and other platinum metal minerals.* Amer. Min., 1958, **43**, 503–516.

Eight new microanalyses of iridosmine are reported. Five of these show Pd, maximum 1·2%. One shows 93% Os, much higher than previously reported. A. P.

ZHERU (M. I.)] Жеру (М. И.). Красная шпинель в мраморах месторождения Перевал и ее вторичные изменения. [*Ruby spinel in marbles of the Pereval deposits and its secondary alterations.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1959, no. **2**, 107–114, 5 figs.

A red spinel found in forsterite marble in Pereval, near Slyudyanka of the southern Baikal region, gives on analysis Al_2O_3 69·65, FeO 1·31, CaO tr., MgO 27·51, Cr_2O_3 0·69, V_2O_5 tr., ign. loss 0·76 [= 99·92]; n 1·716. The replacement of spinel by other minerals is discussed. S. I. T.

[SERDYUCHENKO (D. P.) & MOLEVA (V. A.)] Сердюченко (Д. П.) и Молева (В. А.). Титаншпинели из дедоломитизированных кембрийских пород южной Якутии. [*Titaniumspinels from de-dolomitized Cambrian rocks of South Yakutia.*] Зап. Всесоюз Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (6), 691–695.

Spinels are found near the contact of Cambrian limestone and pyroxene syenite-porphyry in the Aldan region of Yakutia. Spinels and forsterite form small lenses in the limestone. The contents of these lenses and also samples of greenish-brown spinel were chemically analysed. The analysis of spinel is as follows: Al_2O_3 56·20, Fe_2O_3 17·06, TiO_2 0·50, FeO tr., MgO 26·40, = 100·16; isotopic, n 1·764. Besides this spinel there is present also an opaque ore spinellid, made of a solid solution of Mg_2TiO_4 and magnetite with a small admixture of Fe_2TiO_4. S. I. T.

POTDEVIN (H.) & BRASSEUR (H.). *Étude d'uranates minéraux et synthétiques.* Bull. Acad. roy. Belgique, Classe Sci., 1958, sér. 5, 1958, **44**, 874–912, 15 figs.

Billietite has the formula $BaO.6UO_3.10H_2O$; space group *Pnmn*, a 7·12, b 12·00, c 15·06 kX. There are two varieties of billietite. [M.A. **10**–146; **11**–109]. Becquerelite, $CaO.6UO_3.10H_2O$, has space group *Pmma*, a 13·82, b 12·48, c 14·89 kX. Wölsendorfite, $PbO.2UO_3.2H_2O$, has a 13·95, b 11·95, c 7·02 kX. [M.A. **13**–520; A.M. **42**–919]. The artificial uranates $BaO.3UO_3.5H_2O$ and $SrO.3UO_3.5H_2O$ are also described. For all these compounds synthesis and dehydration are studied and powder diagrams described. A new method, based on measurement of doublets, allows

precise determination of the parameters. In all uranates of formula $mXO.nUO_3.pH_2O$ there exists a sub-unit of approximate dimensions a'' 7·02, b'' 4·18, c'' 7·25 kX. The crystal structure is built of $U(O,OH)_n$ sheets, pseudohexagonal, and parallel to (001). J. M.

Pabst (Adolf). *On the hydrates of sodium carbonate, a correction, and the crystallography of trona.* Amer. Min., 1959, **44**, 274–281, 2 figs., 4 tables.

Re-examination of material described as $Na_2CO_3.2\frac{1}{2}H_2O$ by the author in 1930 [A.M. **15**–69–73] proves that it is trona, $Na_3H(CO_3)_2.2H_2O$. All past reports of the hemipentahydrate probably involved the same small errors. A new setting of trona is based on the cell dimensions a 20·11, b 3·49, c 10·31Å, β 103° 8′; space group $I2/c$. A revised angle table and indexed powder pattern is given. B. H. B.

[Eremeev (V. P.)] Еремеев (В. П.). О гидромагнезиальных минералах в Актовракском гипербазитовом массиве. [*On hydromagnesian minerals in the Aktovrak hyperbasite massif.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst.Geol. of Ore-deposits, Petrography, Mineralogy & Geochemistry], 1957, no. 10, 29–40, 8 figs.

Certain minerals found in the veinlets intersecting a serpentinized peridotite of Aktovrak, Western Tuva, are described. Description and chemical analyses are given of artinite (I), hydromagnesite (II), α-cerolite (III) as well as dolomite and calcite :

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O
I	0·50	—	0·87	0·10	—	—	41·85	0·45	—
II	tr	—	0·18	—	—	—	42·20	—	—
III	45·53	tr	0·22	0·11	—	tr	29·89	4·58	0·14

	K_2O	CO_2	P_2O_5	H_2O+	H_2O-	Total	a	γ	2V
I	—	22·45	—	31·92	1·40	99·55	1·502	1·556	70°
II	—	36·92	—	20·26		99·54	1·530	1·548	22
III	0·19	4·95	0·06	7·97	6·42	100·06	n 1·530		

X-ray data and heating curves are also given. S. I. T.

[Golovanov (I. M.)] Голованов (И. М.). О находке хантита в месторождении Кургашинкан (Уз. ССР). [*On the occurrence of huntite in the Kurgashinkan deposit (Uzbek S.S.R.)*]. Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1959, **124**, 398–401, 1 fig.

Huntite [M.A. **12**–132] is found in the form of veinlets 1 to 3 cm thick, in the crust of weathering of lightly serpentinized dolomites in the lead-zinc deposit of Kurgashinkan. It is a white chalk-like mineral, sp. gr. 2·65–2·70, H. 2–2½. Analysis by P. L. Prinkhidko gave MgO 36·00, CaO 13·53, CO_2 49·72, $H_2O+1·14$, =100·39. X-ray, spectroscopic, and thermal data are also given. S. I. T.

Thoreau (J.), Aderca (B.), & Van Wambeke (L.). *[...]gisement de terres rares de la Karonge (Urundi).* B[...] Acad. roy. Sci. colon., Bruxelles, 1958, **4**, 684–715, 9 fi[...]

Study of a deposit of bastnäsite. The possible age of t[...] mineralization is 1580 m.y. The minerals are : bastnäsi[...] yellowish or reddish, monazite (with predominance of C[...] La, and Nd, very low content of Y), oxides of iron (goethi[...] limonite, and hematite), kaolinite, and an asphaltic su[...] stance. The radioactivity is due principally to Th. Powd[...] diagrams for bastnäsite and monazite are given. Che[...] anal. by A. Poncin of bastnäsite gave CeO_2 34·60, La_2[...] (+ other rare earths) 34·83, ThO_2 0·02, P_2O_5 6·26, Fe_2[...] 2·74, Mn_3O_4 0·37, PbO 0·28, BaO 0·04, CaO 0·78, Al_2[...] 0·62, V_2O_5 0·03, SiO_2 0·65, CO_2 14·62, F 7·10, U nil, [...] 102·94–O for F 2·99, = 99·95 ; ign. loss 15·04%. J. M.

Zussman (J.). *A re-examination of the structure of tremolit[...]* Acta Cryst., 1959, **12**, 309–312, 2 figs.

Improved values of the x and y co-ordinates have bee[...] obtained for the structure of tremolite $Ca_2Mg_5Si_8O_{22}(OH[...]$ using Weissenberg photographs. The atomic co-ordinat[...] differ from those of the idealized structure [M.A. **4**–20[...] similarly to those of crocidolite [M.A. **11**–101] and actinoli[...] [M.A. **13**–15]. Accurate lattice parameters have bee[...] derived for tremolite and actinolite from X-ray powde[...] patterns. Tremolite has a 9·840, b 18·052, c 5·275Å, [...] 104·7°, and actinolite a 9·861, b 18·111, c 5·336, β 105·0[...] Cell parameters of hydroxy-tremolite are larger than thos[...] of fluor-tremolite [M.A. **12**–415]. Chem. anal. by R. A[...] Howie gave SiO_2 57·66, TiO_2 0·01, Al_2O_3 1·51, Fe_2O_3 0·2[...] FeO 0·33, MnO 0·01, MgO 24·34, CaO 13·79, Na_2O 0·1[...] K_2O 0·02, F nil, H_2O- 2·22, H_2O - 0·04, =100·28. D calc[...] 2·99 g/cm³. W. S. M.

Oliver (R. L.). *Andradite from the Island of Jersey.* Bull[...] Soc. Jersiaise, 1958, **17**, 181–184.

Massive chestnut-brown garnet, associated with epidote[...] quartz, chlorite, and minor iron ore, occurs in metamor[...] phosed andesite close to a granite contact at Côtil Point[...] Jersey. The garnet has n 1·863, sp. gr. 3·72, a 11·996Å [...] its analysis gave SiO_2 36·40, Al_2O_3 4·25, TiO_2 0·05, Fe_2O[...] 25·29, FeO 2·41, MnO 1·55, MgO 0·02, CaO 30·51, Na_2O 0·14[...] K_2O 0·08, =100·70, together with (in p.p.m.) Ni 70, Cu 30[...] Ga 20, Sc 20, Ba 10, Cr tr., equivalent to 80·3 wt% of the[...] andradite molecule. [M.A. **12**–362] R. A. H.

[Mozgova (N. N.)] Мозгова (Н. Н.). О гизингерите и [...]стильпномелане из скарново-полиметаллического место-рождения верхнего рудника Тетюхе. [*On hisingerite and stilpnomelane from the skarn-polymetallic deposit of the upper mine of Tetukhe.*] Минер. Сборник Львовского Геол. Общ. [Min. Sbornik Lvov Geol. Soc.], 1957, no. 11, 273–287, 6 figs.

The skarn-polymetallic deposit of Tetukhe, Far Eastern vince, contains many cavities, some measured in cubic res, infilled with crystalline, semi-crystalline, and loidal minerals, some of them occurring in a semi-liquid te. Two groups of minerals are described : (1) hisingerite, urring as dark brown to black glassy masses, (2) stil- melane, occurring as greenish-brown, gel-like or re- stallized masses. Also are present a greyish felt-like or estos-like amphibole mineral and an opaline substance. singerite on analysis gave SiO_2 33·60. TiO_2 tr., Al_2O_3 0·84, $_2O_3$ 38·92, FeO 0·89, MnO 0·27, MgO 0·44, CaO 1·18, O+ 7·24, H_2O - 16·58, = 99·96 ; sp. gr. 2·49, n 1·468. lpnomelane on analysis gave SiO_2 35·64, TiO_2 tr., Al_2O_3 9. Fe_2O_3 27·80, FeO 5·32, MnO 3·08, MgO 2·12, CaO 3·11, $_2O$ 0·11, K_2O 0·09, H_2O+ 7·85, H_2O− 7·31, ='99·82' ; . gr. 2·89 ; α 1·643, γ 1·685. X-ray and thermal data are ven. S. I. T.

Loshko (V. V.)] Плошко (В. В.). Об акцессорном ортите из актинолититов р. Малой Лабы. [*On accessory orthite from actinolitites of the Malaia Laba river.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1958, no. 11, 113–117, 1 fig.

Orthite from actinolitite from Northern Caucasus is scribed. On analysis it gave SiO_2 30·96, TiO_2 0·20, Al_2O_3 3·24, Fe_2O_3 5·64, FeO 4·29, MgO 2·45, MnO 0·08, CaO 11·86, O 0·52, Na_2O 0·33, TR_2O_3 17·08, ThO_2 2·28, H_2O− 0·44, $_2O$+ 2·62, P_2O_5 2·10, F 0·18, =99·27 − 0·07 = 99·20. ptical data α 1·700–1·704, β 1·709–1·714, γ 1·713–1·718, V (±) 70–90°, pleochroism α faint light yellow, β light yellow ith a green tinge, γ yellow, greenish-brown. S. I. T.

hamrai (I. A.) & Radushev (V. I.)] Шамрай (И. А.) и Радушев (В. И.). Глауконит из меловых отложений р. Белой на Северном Кавказе. [*Glauconite from the Cretaceous deposits of the river Belaya in the Northern Caucasus.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1959, **124**, 900–902, 2 figs.

Small glauconite grains, separated from sandstone of ower Cretaceous age, on analysis gave SiO_2 50·83, Al_2O_3 ·69, Fe_2O_3 23·01, FeO 1·10, MgO 0·50, CaO 2·30, MnO 0·06, a_2O 1·17, K_2O 2·71, P_2O_5 0·97, SO_3 1·10, H_2O+ 5·98, $_2O$− 2·60, =100·02. Refr. ind. 1·590–1·600. X-ray and hermal data are given. S. I. T.

tewart (D. B.). *Narsarsukite from Sage Creek, Sweetgrass Hills, Montana.* Amer. Min., 1959, **44**, 265–273, 1 fig., 3 tables.

Narsarsukite, $Na_2TiSi_4O_{11}$, occurs in veinlets with quartz, alcite, and galena in the Sweetgrass Hills of north central Iontana, U.S.A. The host rock is an orthoclase-albite-aegirine-quartz hybrid. An indexed X-ray powder pattern is given. Narsarsukite is tetragonal dipyramidal, space group $I4/m$; a 10·72, c 7·94Å, c/a 0·741 ; ε 1·658–1·662 and ω 1·610–1·614, slightly higher values than for narsarsukite from Greenland. Geochemical study shows that narsarsukite probably formed by reaction of emanations from alkalic magmas with siliceous wallrock under a high partial pressure of oxygen. B. H. B.

McKie (D.). *Notes on some minerals from Tanganyika.* Rec. Geol. Surv. Tanganyika, 1958, **5**, 81–94, 2 pls.

A tabular ruby corundum crystal and a calcite crystal of unusual habit are described. The morphology of 41 large uraninite crystals from Morogoro District is described in detail ; the development of step-pyramids on unique cube faces is discussed, and a twin about [111] is figured. Some large allanite crystals from Ufipa, including a rare twin on (100), are described. Native antimony is reported for the first time from Africa. X-ray powder data for euclase and pickeringite are recorded ; existing data for newberyite are amplified. A new locality for pickeringite is reported and the occurrence of alunogen in Tanga District is confirmed. Partial analyses and physical data are given for lithium minerals from the Hombolo group of pegmatites ; (1), lepidolite, Hombolo, total FeO 0·28, total MnO 0·78, Li_2O 3·68, 2Vα 39°, γ 1·567, sp. gr. 2·88, polymorph $2M_1$; (2) mauve lepidolite, Mayetu Hills, total FeO 0·61, total MnO 1·11, Li_2O 3·27, 2Vα 29°, γ 1·578, sp. gr. 2·82, polymorph $2M_1$; (3) brown lepidolite, Mayetu Hills, total FeO 1·57, total MnO 1·51, Li_2O 5·40, 2Vα 36°, γ 1·571, sp. gr. 2·87, polymorph $2M_2$; (4), rubellite, Hombolo, total FeO 0·93, total MnO 0·81, Li_2O 1·61, sp. gr. 3·00. The turquoise and aluminian redondite occurring in Tanga District are discussed. An analysed vanadian dravite has a 15·92Å c 7·21$_5$Å, ε 1·622, ω 1·644, sp. gr. 3·125. J. Ph.

[Litzarev (M. A.)] Лицарев (М. А.). Датолит из архейских кальцифиров среднего течения р. Куранах в Южной Якутии. [*Datolite from the Archaean calciphyres of the middle reaches of the river Kuranakh in South Yakutia.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr., Min. & Geochem], 1957, no. 10, 5–11, 3 figs.

Nests and veins of datolite are found in diopside calciphyre. Two generations of datolite are distinguished : I, early, fine grained : II, later, coarse grained. The analyses and the optical properties of these two varieties are respectively : SiO_2 36·58, 36·65, TiO_2 abs., Al_2O_3 0·86, abs., B_2O_3 20·41, 21·77, Fe_2O_3 0·08, 0·54, FeO —, 0·24, MnO abs., CaO 35·34, 34·85, MgO abs., CO_2 0·53, 0·54, H_2O+ 5·41, 5·44, H_2O− 0·40, 0·11, =99·61, 100·14, α 1·631, 1·631, γ 1·677, 1·680, 2V–, −74°. X-ray data are also given. S. I. T.

Mason (Brian). *Axinite from the Perth river, Westland, New Zealand.* New Zealand Journ. Geol. Geophys., 1959, **2**, 137–140, 1 fig.

Axinite (α 1·674, β 1·681, γ 1·684, 2Vα 70°, sp. gr. 3·18), associated with clinozoisite (α 1·713, β 1·720, γ 1·727, 2Vγ 88°, sp. gr. 3·25), occurs in quartz veins cutting sheared greywackes. The relatively low refractive indices and measured density of the axinite suggest considerable replacement of (Mn+Fe) in the lattice by Mg. This is the first record of axinite in New Zealand. W. A. W.

[Pertzev (N. N.) & Nikitina (I. B.)] Перцев (Н. Н.) и Никитина (И. Б.). Новые данные о серендибите. [*New data on serendibite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 169–172, 3 figs.

Serendibite is found in spinel-diopside skarn in the Taezhny deposit, South Yakutia, Siberia. Two chem. anal. gave : SiO_2 22·08, 24·98, TiO_2 0·17, 0·26, Al_2O_3 30·68, 32·46, B_2O_3 6·95, 6·63, Fe_2O_3 5·05, 2·39, FeO 6·06, 4·02, MnO 0·16, 0·16, MgO 12·92, 12·56, CaO 14·93, 15·08, H_2O+ 0·75, 1·11, rest 0·25, 0·25, =100·00, 99·90 ; sp. gr. 3·515, 3·453 ; α 1·738, 1·719, γ 1·743, 1·725, 2V(+) about 90°, 90° ; X-ray data *a* 10·35, *b* 9·2, *c* 8·5Å, α 65° 30′, β 86°, γ 65°. Formula : $Ca_4(Mg,Fe^{2+},Al)_6(Al,Fe^{3+})B_3(Si,Al)_6O_{40}$. S. I. T.

Knorring (O. von). *Helvine from a lithium pegmatite near Salisbury, Southern Rhodesia.* Min. Mag., 1959, **32**, 87–89.

Helvine occurs associated with microcline-perthite, quartz, petalite, spodumene, muscovite, spessartine, and subordinate columbite and blue apatite, in the pre-Cambrian Casa Ventura pegmatite, 16 miles east of Salisbury, Southern Rhodesia. It forms small (1–2 mm) sulphur-yellow, tetrahedral crystals with *n* 1·732, sp. gr. 3·22 : chem. anal. by O. von Knorring gave SiO_2 33·62, Al_2O_3 1·21, BeO 12·88, FeO 2·24, MnO 45·46, ZnO 1·20, MgO tr., CaO 0·30, Na_2O 0·03, K_2O 0·08, Li_2O 0·15, H_2O- 0·02, S 5·64, =102·83, less O≡S 2·81, equal to 100·02. [M.A. **9**–61, **11**–511, **12**–343] R. A. H.

[Sosedko (A. F.) & Denisov (A. P.)] Соседко (А. Ф.) и Денисов (А. П.). Первая находка симпсонита в СССР. [*The first discovery of simpsonite in the U.S.S.R.*] Доклады Акад. Наук СССР [C.R. Acad. Sci. U.S.S.R.], 1958, **118**, 811–814.

Simpsonite is found in a pegmatite vein near Leshai in the northern part of Kola peninsula. In colour it is white to cream, H. 7, sp. gr. 6·61, uniaxial negative, ε 1·976, ω 1·034 [probably misprint for 2·034]. An approximate chemical analysis of a small sample gave Al_2O_3 24·47, Ta_2O_5 68·32, Nb_2O_5 3·65, ='96·44', corresponding to the formula $4Al_2O_3.3Ta_2O_5$. X-ray data : *a* 7·37774, *c* 4·51616Å. Some of crystals are coated with a reddish-brown substance m of mangantantalite(?) and microlite. [M.M. **25**–374, 63 S. I. T

Hutton (C. O.). *Manganomossite restudied.* Amer. M 1959, **44**, 9–18, 1 fig.

Manganomossite $(Mn,Fe,U,Th)_{3\cdot97}(Nb,Ta,Ti)_{7\cdot99}O_{24}$, fr Yinnietharra, Western Australia, is a metamict columb with UO_2 0·96. *D* 6·17 gm/cm³. Heated in vacuo at 80 or 1200°C for 3/4 hr. gave strong X-ray pattern which n be indexed for orthorhombic unit cell, *a* 5·09, *b* 14· *c* 5·725Å. Anal. by author gave MnO 9·42, FeO 7·61, U 0·96, ThO_2 0·059, Nb_2O_5 40·69, Ta_2O_5 38·86, TiO_2 0· H_2O+ 2·16, H_2O- 0·31, =100·47. A. C. H

Hess (H. D.) & Trumpour (H. J.). *Second occurrence fersmite.* Amer. Min., 1959, **44**, 1–8, 2 figs.

Fersmite, rare calcium columbate of AB_2O_6 group, occ as small anhedral inclusions in and intergrowths with tantalum-free columbite in Ravalli County, Montana. T habit is prismatic, cell dimensions are *a* 5·764, *b* 15· *c* 5·232Å ; sp. gr. 4·79, color dark brown-black, stre grayish-brown, lustre resinous, H. 4–4½, cleavage no fracture subconchoidal, tenacity brittle. Refr. ind. : lithium light, α 2·07, β 2·08 (calc.), γ 2·19. Analysis ga CaO 15·02, Cb_2O_5 74·44, Ta_2O_5 nt. fd., La_2O_3+minor Ce 6·36, TiO_2 2·01, SiO_2 0·32, MnO 0·11, Fe_2O_3 0·34, ThO_2 0· Al_2O_3 0·10, MgO nt. fd., Na_2O nt. fd., F nt. fd., U_3O_8 0· H_2O 0·18, ='99·04'. A. C. H.

[Aleksandrov (V. B.) & Pyatenko (Y. A.)] Александр (В. Б.) и Пятенко (Ю. А.). Рёнтгенометрическое иссле вание некоторых метамиктных титанониобатов. [*X-ray examination of certain metamict titanoniobate* Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R 1959, **124**, 179–182.

Seven samples of euxenite, polycrase, and blomstrandi were studied by the X-ray powder method. Prior heating they all proved to be X-ray amorphous. On heati at 800°C, although the powder patterns became distin interpretation was unsatisfactory, and it was only aft heating to 1100°C that the line pattern became sufficient clear, and 'extra' lines were found to be present in t patterns of euxenite and blomstrandine. These lin corresponded to a cubic phase having a fluorite type structure and *a* 5·07–5·13Å. Excluding this phase t minerals studied possessed an orthorhombic lattice, havi the following parameters : polycrase *a* 5·55, *b* 14·62, *c* 5·19Å blomstrandine *a* 5·53, *b* 14·50, *c* 5·16Å ; euxenite *a* 5·56, *b* 14·7 *c* 5·17Å. An isomorphous series euxenite-polycrase

postulated with priorite as a synonym for euxenite, and tomstrandine as a synonym for polycrase. S. I. T.

HOREAU (J.). *Variscite et strengites de la pegmatite de Kobokobo (Congo Belge).* Bull. Acad. roy. Belgique, Classe Sci., 1958, sér. 5, **44**, 813–817.

Three phosphates are described : variscite (A) in spheroidal concretions of pale rose, radiating fibres, with negative elongation, highest and lowest indices 1·577 and 1·608 ; strengite (B) blue, slightly pleochroic, in small, radially fibrous concretions, the fibres very fine with positive elongation and straight extinction, α a little >1·69, γ a little <1·72 ; strengite (C) rose-coloured, with marked pleochroism carmine to colourless, formed mainly of small prisms with polyhedral terminations, elongation ‖ γ, γ 1·763, β and α near 1·73. Powder data are given for the three minerals. Chem. anal. by G. Bastien gave :

	CaO	Al_2O_3	Fe_2O_3	MnO	P_2O_5	H_2O	insol.	Total
A	1·65	21·10	11·81	3·09	41·50	20·93	—	100·08
B	—	—	42·00	1·21	37·90	18·64	0·60	100·35
C	—	—	44·05	0·89	37·27	18·36	—	100·57

J. M.

ROSS (MALCOLM). *Mineralogical applications of electron diffraction II. Studies of some vanadium minerals of the Colorado Plateau.* Amer. Min., 1959, **44**, 322–341, 11 figs., 4 tables.

Precise unit cell data in two dimensions are obtained for platy minerals from orientated electron diffraction powder patterns [A.M. **43**–1157]. Partial unit cell data and some structural relationships are given for eleven vanadium-bearing minerals from the Colorado Plateau, U.S.A. ; these are : hewettite, barnesite, corvusite, fernandinite, navajoite, steigerite, fervanite, simplotite [A.M. **43**–16 ; M.A. **14**–198], two new 'corvusite-like' minerals, and one new hydrated calcium vanadyl vanadate. Electron diffraction powder data cannot be compared directly with X-ray powder data for identification purposes. B. H. B.

FISHER (D. JEROME) & RUNNER (J. J.). *Morinite from the Black Hills.* Amer. Min., 1958, **43**, 585–594, 1 fig.

The cell dimensions of morinite from the Hugo mine, Keystone, South Dakota, are found to be : *a* 9·456, *b* 10·690, *c* 5·445Å, γ 105° 27½′, space group $P2_1/m$ or $P2_1$. An indexed powder pattern is given. Optical properties and morphology are compared with earlier data. Using the cell dimensions of the Black Hills morinite and the composition and density, 2·96, of Finnish morinite by Volborth [M.A. **12**–568], the idealized cell content, $Ca_4Na_2Al_4(F,OH)_{10}P_4O_{16}3H_2O$, is found. The Black Hills morinite is associated with montebrasite, apatite, augelite, wardite, probably crandallite, quartz, and clay. A. P.

[DUBININA (V. N.) & KORNILOVICH (I. A.)] Дубинина (В. Н.) и Корнилович (И. А.). Плюмбоярозит в зоне окисления свинцово-цинковых месторождений Восточного Забайкалья. [*Plumbojarosite in the oxidized zone of lead-zinc deposits in East Transbaikal region.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (3), 323–328, 7 figs.

Plumbojarosite is found as compact and powdery aggregates of flaky crystals in the Akatuev deposit in eastern Transbaikal region. On analysis it gave Fe_2O_3 41·08, PbO 24·14, SO_3 21·05, As_2O_5 3·12, H_2O 9·43, insol. res. 1·03, =99·85. Thermal, X-ray, and spectroscopic data are given. S. I. T.

[GAZIZOVA (K. S.) & RUSAKOV (M. P.)] Газизова (К. С.) и Русаков (М. П.). О фиброферрите из Коунрадского медного месторождения. [*On fibroferrite from the Kounrad copper deposit.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 184–187, 2 figs.

Fibroferrite veinlets are found between the zones of oxidation and secondary sulphide enrichment in the Kounrad deposit in central Kazakhstan. With its fibrous structure it resembles asbestos. It is of a pistachio-greenish colour, sp. gr. 1·97, H. about 3 ; α 1·533, γ 1·570. Chem. anal. gave Fe_2O_3 32·33, FeO abs., SO_3 31·65, H_2O 34·39, insol. res. 2·42, =100·79. The heating curve is given. S. I. T.

[BOBROVNIK (D. P.)] Бобровник (Д. П.). Хлоритоподобные и коллоидальные минералы в составе вулканических пород Волыни. [*Chlorite-like and colloidal minerals from the volcanic rocks of Volhynia.*] Минер. Сборник Львовского Геол. Общ. [Min. Mag. Lvov Geol. Soc.], 1957, no. 11, 223–229, 5 figs.

Greenish and brownish gel-like substances, infilling vesicles and cracks in Volhynian basalts, are described, and particularly a detailed description is given of colloidal and metacolloidal material forming one of the amygdules in a basalt. Chem. anal. gave SiO_2 33·43, TiO_2 abs., Al_2O_3 13·88, Fe_2O_3 1·62, FeO 11·00, MgO 24·62, CaO 0·81, Na_2O+K_2O abs., H_2O+ 12·13, H_2O- 2·50, =99·99 ; sp. gr. 2·62 ; refr. ind. 1·540 (metacolloidal), 1·506–1·532 (isotropic). The X-ray data show the similarity of this material to pennine. The dehydration curve shows that the main part of water is given out at 700–800°C. S. I. T.

SUDO (TOSHIO). *Mineralogical studies on green vitric tuff of Japan.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 249–255, 1 fig.

Glass fragments in vitric tuffs are altered to 'green earth'

yielding X-ray powder patterns in general agreement with those of glauconite and celadonite though more diffuse and showing fewer lines. The mineral is mostly extremely fine-grained, but it contains veinlets and other small aggregates of better crystallized blue-green material (r.i. 1·59–1·60), partly altered to a brown material. Opalization is noted. Analyses : green mineral powder, Shiroishi, mean r.i. 1·56–1·58, containing small amount of plagioclase (I) ; containing small amount of the brown alteration product (II) ; green mineral powder, Nashino, (III). Analyst : H. Minato.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	Na_2O	K_2O	'H_2O+'	'H_2O-'
I	55·55	9·45	10·68	2·21	2·69	3·28	0·57	2·90	5·55	7·39
II	48·62	3·28	18·29	2·63	2·41	4·64	0·58	3·68	8·94	6·84
III	53·45	0·43	17·25	6·88	3·18	4·12	0·70	7·40	9·09	1·88

TiO_2 —, 'non', —, ; MnO tr., 'non', 1·57 ; total, 100·27, 99·91, '99·95' respectively. 'H_2O+' is ignition loss above 150°C.

D. S. C.

Hutton (C. Osborne). *Contributions to the mineralogy of New Zealand, Part IV*. Trans. Roy. Soc. New Zealand, 1957, **84**, 791–803, 2 figs.

Rhodonite-spessartine-rhodochrosite schists of the chlorite zone (sub-zone Chl. 4) occur as narrow lenses in association with albite-epidote-chlorite-schists in Arrow Valley, Western Otago. It is believed that these schists are the equivalents of manganiferous sediments precipitated by submarine volcanic action. Properties of the minerals include : rhodochrosite, ω 1·803 ; spessartine (I), n 1·797–1·801, mostly 1·798±0·001, sp. gr. at 21°C 4·15 (range 4·12–4·16), a 11·62±0·005Å ; rhodonite (II), α 1·723±0·002, β 1·729, γ 1·737, $2V\gamma$ 70°–73°, $r<v$ very weak to absent, sp. gr. at 21°C 3·60±0·01. Xenotime, gahnite, and staurolite (optical properties) are described from sands and gravels from Port Pegasus area, Stewart Island. Xenotime shows {011}, {010}, {111}, {110} and twinning on {111}, ω 1·720±0·002, ε 1·820, sp. gr. at 21°C 4·68 ; a 6·895, c 6·036 both ±0·005Å ; SiO_2 1·67, Al_2O_3 0·26, Fe_2O_3 1·33, Y_2O_3 44·29, Er_2O_3 16·63, Ce_2O_3 0·57, ThO_2 0·87, UO_2 0·11, MnO tr., MgO 0·32, CaO 0·61, P_2O_5 32·68, H_2O+ 0·13, H_2O- 0·09, TiO_2 tr., SO_3 tr.?,=99·56. Indexed X-ray powder data are given for xenotime from Mudtow Pegasus district, and from Bankatinwinning, Indonesi and also for gahnite (III) from Stewart Island which sho {111}, {110}, {113}, n 1·793–1·797, sp. gr. at 22°C 4·46±0·0 a 8·104±0·003Å. Gahnite from Japan and Ceylon [M.M **24**–547] give a 8·097±0·004Å and 8·086±0·002Å respe tively.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	ZnO	MgO
I	35·87	tr	20·84	0·06	1·78	38·24	—,	0·22
II	46·42	tr	0·07	0·11	1·49	47·62	—	0·92
III	0·03	tr	58·02	—	14·53	tr	25·37	1·52

	CaO	P_2O_5	H_2O+	H_2O-	Total
I	2·72	—	—	0·15	99·88
II	3·26	—	—	0·18	100·07
III	Nil	—	—	0·23	99·70

D. S. C. & R. A. H.

McKie (D.). *Mineralogical notes*. Rec. Geol. Surv. Tan ganyika, 1958, **6**, 87–93, 1 pl.

The occurrence of $2M_1$, $2M_2$ and 1M lepidolite polymorph is recorded in the Hombolo pegmatites ; 7 new Li_2O deter minations in lepidolite range from 1·44 to 5·99%. The dis tribution of mica polymorphs in certain pegmatites, granites carbonatites, and metamorphic rocks is recorded. A slightly metamict monazite from the Bundali Hills has 6·9% ThO_2 and 0·8% U_3O_8. Morphological data are given for a columbite crystal from Mbulu. The swelling clay in the Gelai magnesite deposit is assigned to hectorite, which is considered to have been formed, instead of a normal alu minous bentonite, by the action of Mg^{2+} rich waters on volcanic ash ; analysis gave SiO_2 51·51, TiO_2 0·17, Al_2O_3 0·68, Fe_2O_3 0·94, FeO nil, MgO 23·37, CaO 5·81, H_2O+ 5·90, H_2O- 10·58, =98·96, after recalculation of Cl, SO_3, CO_2 as salts. An occurrence of analcite in lake sediments is reported. Prehnite, melanterite, and cinnabar are recorded from Tanganyika for the first time. A new occurrence of molybdenite near Dodoma is discussed. Previous records of rubellite from Jumbadimwe and emerald from the Nguru mountains are corrected to thulite (MnO 0·08%, β 1·690) and chromian-tremolite (Cr_2O_3 0·47%, −2V 88°, $\gamma:c$ 22°) respectively.

J. Ph.

NEW MINERALS

[Bonshtedt-Kupletskaya (E. M.)] Бонштедт-Куплетская (Э. М.). Новые минералы. VII. [*New minerals. VII.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (4), 476–493.

Among the minerals listed in this article the following eight have not as yet been recorded in Mineralogical Abstracts :

[Zalashkova (N. E.) & Kukharchik (M. V.)] Залашкова (Н. Е.) и Кухарчик (М. В.). Висмутомикролит—новая разновидность микролита. [*Bismuthmicrolite—a new variety of microlite.*] Тр. инст. минер. геохимии и кристаллохим. редк. элем. [Trans. Inst. Min. Geochem. & Crystalchem. of Rare Elements], 1957, no. 1, pp. 77–79.

This new mineral occurs as inclusions in finely scaly pidolite in a pegmatite vein in the Altai Mts. Colour dark een to emerald-green, lustre adamantine, transparent, in nall fragments, isotropic ; rare octahedral forms : n 2·044 ; . gr. 6·426. Chem. anal. gave Na_2O 5·27, K_2O 0·08, CaO 30, MnO 0·08, Fe_2O_3 0·32, Bi_2O_3 3·25, TR_2O_3 0·18, Al_2O_3 45, TiO_2 0·05, Nb_2O_5 0·08, Ta_2O_5 79·72, H_2O+ 0·60, 2·00, = 100·68–0·78 for F, = 99·90. Corresponding to $[a,Ca,Bi)_2Ta_2O_6(F,OH,O)$. X-ray data, a 10·62Å, non-etamict, powder photograph lines of an unheated speci-en differ from those of a specimen heated at 900°C.

ABRAMOVICH (YU. M.)] Абрамович (Ю. М.). Псевдоморфизм в осадочном минералообразовании. [*Pseudomorphism in sedimentary mineral formation.*] Вопросы Мин. Осад. Образований, Книги 3-я и 4-я Изд. Львов. Унив. [Problems Min. Sed. Formations, Books 3 and 4, Publ. Lvov Univ.], 1956, pp. 80–86.

The name *ordite* (after the village Orda, Perm region) is pplied to a pseudomorph of gypsum after gypsum.

CHERNIKOV (A. A.), KRUTETZKAYA (O. V.), & ORGANOVA (N.I.)] Черников (А. А.), Крутецкая (О. В.) и Органова (Н. И.). Натроотенит. [*Natroautunite.*] Атомн. Энер. [Atomic Energy], 1957, **3** (8), 135–140.

A new mineral, named *natroautunite* [sodium autunite .M. **43**–383], occurs in the form of small elongated or quare plates, forming segregations in a granodiorite [no ocality given]. Colour lemon-yellow to salad-yellow. erfect (001) cleavage, less perfect (100), H. 2–2½, sp. gr. ·584 (calc. 3·89), lustre on cleavage planes pearly, in other irections vitreous. Tetragonal, D^7_{4h}–$P4/nmm$, a 6·97, 8·69Å, uniaxial, negative ω 1·578, ε 1·559, weakly pleo-hroic. Chem. anal. gave UO_3 62·53, P_2O_5 14·69, Na_2O 6·88, aO 0·14, H_2O 14·84, = 99·08 ; a less pure specimen UO_3 1·9, P_2O_5 15·56, Na_2O 5·62, CaO 1·2, SiO_2 1·6, CO_2 0·24, IgO 0·43, Al_2O_3 0·32, Fe_2O_3 0·97, H_2O+ 4·05, H_2O- 9·02, =100·91. Formula : $Na_2(UO_2)_2(PO_4)_2.8H_2O$.

NEKRASOVA (Z. A.)] Некрасова (З. А.). Водный фосфат уранила и аммония (урамфит) — $NH_4(UO_2)PO_4.3H_2O$. [*Hydrous phosphate of uranil and ammonia (uramphite)*—$NH_4(UO_2)PO_4.3H_2O$.] Вопросы геол. урана, Атомиздат. [Probl, Geol. Uranium, Atomizdat.], 1957, pp. 67–72.

A new mineral, named *uramphite*, occurs as aggregates f small square-shaped flakes in the zone of oxidation of an ranium-coal deposit (no locality given). Colour bottle-reen to pale-green, lustre vitreous, cleavage along two irections, transparent, optically negative, α 1·564, $\beta = \gamma$ ·585, sp. gr. 3·7. Chem. anal. gave NH_4 4·60, UO_3 68·70, P_2O_5 15·63, H_2O 11·00, = 99·93. On the heating curve it as endothermal stops at 105–140°C (loss of water) and t about 500° and one exothermal stop at 600°C. X-ray owder data are given, the strongest lines being 3·78 (10), ·22 (9), 1·694 (9–8), 2·75 (8), 2·12 (8). [A.M. **44**–464]

[SEMENOV (E. I.)] Семенов (Е. И.). Новые водные силикаты бериллия — гельбертрандит и сферобертрандит. [*New hydrous silicates of beryllium—gelbertrandite and sphaero-bertrandite.*] Тр. инст. минер. геохимии и кристаллохимии редк. элем. [Trans. Inst. Min. Geochem. Crystallochem. of Rare Elements.], 1957, no. 1, 64–69.

The new name *gelbertrandite* is applied to a colloidal variety of bertrandite. It resembles glass, colour pale-violet, fracture conchoidal, lustre vitreous, transparent when fresh, isotropic n 1·511–1·530, H. about 4, sp. gr. 2·176. Chem. anal. gave SiO_2 38·70, Al_2O_3 1·20, BeO 34·16, CaO 1·93, Na_2O+K_2O 0·33, H_2O+ 15·62, H_2O- 8·17, = 100·11. The new name *sphaerobertrandite* is applied to bertrandite occurring in the form of small spherulites ; colour yellow, lustre vitreous, H. 5, sp. gr. approx. 2·5 ; optically biaxial and negative, α 1·595, γ 1·612, 2V about 70°, weakly pleochroic. Chem. anal. gave SiO_2 41·03, Al_2O_3 1·40, Fe_2O_3 0·07, BeO 45·20, H_2O+ 11·70, H_2O- 0·30, = 99·70. Both minerals are found in pegmatite veins in the Khibina and Lovozero tundras of Kola peninsula, replacing epididymite.

[RAZUMNAYA (E. G.), SMELYANSKAYA (G. A.), KOROLEV (K. G.), & POKULNIS (G. V.)] Разумная (Е. Г.), Смелянская (Г. А.), Королев (К. Г.) и Покульнис (Г. В.). Об аршиновите — новой метаколлоидной разновидности циркона. [*On arshinovite—a new metacolloidal variety of zircon.*] Мет. иссл. мин. сырья. Госгеолтехиздат. [Methods of Study of Raw Materials, Gosgeoltekhizdat.], 1957, 45–50.

The name *arshinovite* (after V. V. Arshinov) is applied to a metacolloidal zircon occurring as grey veinlets in phosphorites and phosphate-bearing rocks. Transparent and almost colourless, isotropic to weakly anisotropic, n 1·650–1·660, sp. gr. 3·3. Chem. anal. indicate $SiO_2 : ZrO_2$ about 1 : 1, also contains U and Hf. X-ray powder photograph is similar to that of zircon but with diffuse lines. [A.M. **44**–210]

[CHERNIKOV (A. A.), KRUTETZKAYA (O. V.), & SIDELNIKOVA (V. D.)] Черников (А. А.), Крутецкая (О. В.) и Сидельникова (В. Д.). Урсилит — новый силикат урана. [*Ursilite—a new silicate of uranium.*] Вопросы геол. урана, Атомиздат. [Probl. Geol. Uranium, Atomizdat.] 1957, 73–77.

Ursilite occurs in two varieties, *calcium-ursilite*, $2CaO.2UO_3.5SiO_2.9H_2O$, and *magnesium-ursilite* $2MgO.2UO_3.5SiO_2.9H_2O$, as lemon-yellow earthy masses, kidney-shaped small aggregates, and radial spherulites in joints in quartz porphyry (no locality given). It is brittle, H. 3, sp. gr. 3·034 (Ca variety) and 3·254 (Mg variety). Straight extinction, elongation positive, α 1·548, γ 1·556 (Ca variety), α 1·543, γ 1·550 (Mg variety). Chem. anal. of Ca and Mg varieties

gave respectively : SiO_2 26·67, 26·80, Fe_2O_3 0·27, —, CaO 6·67, 0·79, MgO 1·55, 6·72, UO_3 49·80, 50·32, H_2O+ 5·83, 14·9, H_2O- 8·33, —, ='99·12', 99·53. [A.M. **44**–464]

S. I. T.

[Bonshtedt-Kupletskaya (E. M.)] Бонштед-Куплетская (Э. М.). Новые минералы. VIII. [*New minerals. VIII.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 309–322.

Among the minerals listed in this article the following twelve minerals have not as yet been recorded in *Mineralogical Abstracts* :

[Karpova (Kh. N.), Konkova (E. A.), Larkin (E. D.), & Savelïev (V. F.)] Карпова (Х. Н.), Конькова (Е. А.), Ларкин (Э. Д.) и Савельев (В. Ф.). Авиценнит — новый таллиевый минерал. [*Avicennite—a new thallium mineral.*] [C.R. Acad. Sci. Uzbek S.S.R.], 1958, no. 2, 23–25.

Avicennite, named after Avicenna (Ibn Sina), occurs in a hematite-calcite vein which cuts marmorized and quartzified limestone in the region of the Zirbulakh Mts. in Central Asia. On analysis it gave Tl_2O_3 88·86, Fe_2O_3 4·46, and spectroscopically Sb, Pb, and other elements. The provisional formula is $7Tl_2O_3,Fe_2O_3$. It occurs as very small black crystals having a metallic lustre, resembling perovskite. Cubic, a 9·12Å, Z4. Streak greyish-black, uneven fracture, soluble in acid with the formation of a yellowish-brown surface deposit.

[Semenov (E. I).] Семенов (Е. И.). Окислы и гидроокислы титана и ниобия в Ловозерском щелочном массиве. [*Oxides and hydroxides of titanium and niobium in the Lovozersky alkaline massif.*] Тр. Инст. минер., геохими. и кристаллохими редких элементов. [Trans. Inst. Min. Geochem. Crystallchem. of Rare Elements], 1957, no. 1, 41–59.

Five new names are given. *Niob-anatase* is a white, powdery mineral found in cavities lined with natrolite. A partial analysis of impure material gave TiO_3 31·11, Nb_2O_5 21·61, Ta_2O_5 0·20. X-ray powder photograph similar to that of anatase, a 3·83, c 9·60Å. *Gel-anatase*, *gel-rutile*, the two components of leucoxene formed after ilmenite.

Gerasimovskite (after V. I. Gerasimovsky) is a new name for a niobium belyankinite occurring in ussingite pegmatite as an alteration product of murmanite, lomonosovite, and epistolite. Two analyses gave Nb_2O_5 43·91, 44·90, Ta_2O_5 0·38, 0·50, TiO_2 24·37, 23·44, SiO_2 1·83, 2·30, Fe_2O_3 tr., 0·21, Al_2O_3 —, 0·65, MnO 7·85, 2·65, CaO 1·37, 1·95, MgO —, 0·30, Na_2O —, 0·10, K_2O —, 0·21, CO_2 —, 0·20, H_2O+ 3·85, 7·73, H_2O- 16·55, 14·77, =100·11, 99·91. Platy crystals, brownish-grey colour, pearly lustre, perfect cleavage, H.2, sp. gr. 2·52–2·58. Biaxial, negative, α approx. 1·74, β approx. 1·81, 2V 18°, extinction straight, positive elongation. Heating curve shows endothermal stop at 100–200°.

Mangan-belyankinite, platy crystals, brownish-black colour, sp. gr. about 2·50, biaxial negative, 2V 29° strongly pleochroic. On analysis gave SiO_2 1·51, TiO_2 44·30, Nb_2O_5 7·42, Fe_2O_3 3·77, MnO_2 14·03, CaO 5·77, H_2O 22·36, = 99·1

[Ionov (M. N.)] Ионов (М. Н.). Касситерит и деревянисто олово из Омчугской россыпи. [*Cassiterite and wood ti from the Omchug placer.*] Тр. Всес. Магад. Н.-И. Инс [Trans. All-Union Magadan Sci.-Res. Inst.], 195 no. 19, 9–16.

Dnieprovskite, after the Dniepropetrovsky deposit, is name given to wood tin of a radial structure, by P. Skornyakov in 1944.

[Enikeev (M. R.)] Еникеев (М. Р.). Новый минера наследовит из Алтын-Топканского рудного поля. [*A ne mineral, nasledovite, from the Altyn-Topkan mining field* Докл. А. Н. Узб. ССР. [C.R. Acad. Sci. Uzbek S.S.R. 1958, no. 5, 13–17.

Nasledovite (after B. N. Nasledov) is a new name given t a hydrous basic carbonate-sulphate of Pb, Mn, Al, and Mg It occurs in the oxidation zone of a polymetallic deposi of Sardob in Central Asia, in the form of snow-white radia globules covered by a dark brown crust. On analysis it gav PbO 23·51, MnO 14·97, MgO 3·55, ZnO 0·73, Al_2O_3 19·72 Fe_2O_3 1·34, MnO_2 2·04, SO_3 4·60, CO_2 18·40, H_2O+ 9·80 H_2O- 0·60, SiO_2 1·58, =100·84. H. 2, sp. gr. 3·069 ; γ 1·5 $c : \gamma$ 2°–23°.

[Shishkin (N. N.) & Mikhailova (V. A.)] Шишкин (Н. Н. и Михайлова (В. А.). Изучение вещественного состав руд Ховаксинского кобальтового месторождения. [*Th study of the material composition of ores of the Khovak cobalt deposit.*] Сбор. мат. тех. инф. Вып. 6, Гипро никель. [Collection mat. tech. inform., no. 6, Gipro nickel,], 1956, 5–23.

Hovaxite is a name given to the brown products o oxidation of safflorite and smaltite, and *tuvite* to the yellow products. Both are found in the cobalt mine of the Hovak deposit in the Tuva region of Siberia.

[Mirtov (Y. V.)] Миртов (Ю. В.). Парбигит — новый минерал из группы коллинсита. [*Parbighite—a new mineral belonging to the group of collinsite.*] Вес. Зап.- Сиб. и Новосиб. Геол. Упр. [Bull. West-Siberian and Novosiberian Geol. Dept.], 1958, no. 1, 72–75.

Parbighite is a new name for a phosphate mineral found in a cavity of sandstone in a borehole in the Parbigh region of Tomsk district. It occurs in the form of radial fibrous aggregates, of white, pale-yellow or colourless crystals. Biaxial, negative, α 1·633, β 1·658, γ 1·670, 2V 70°–74°.

DALOV (S. T.) & GOLOVANOV (I. M.)] Бадалов (С. Т.) и Голованов (И. М.). Бирунит — новый минерал из группы таумасита. [*Birunite—a new mineral belonging to the group of thaumasite.*] Докл. А. Н. Узб. ССР. [C.R. Acad. Sci. Uzbek S.S.R.], 1957, no. 12, 17–21.

Birunite (after Al-Biruni) is a new name for a white ·ous mineral forming encrustations on thaumasite nlets in the enstatite-rock of a polymetallic deposit of the nylyk orefield in Uzbekistan. It is biaxial, positive, γ | re elongation, α 1·527, γ 1·531, H. 2, sp. gr. 2·36. Chem. al. of material containing about 6% of opal, is CaO 41·46, O 0·61, SiO_2 26·70, CO_2 15·51, SO_3 3·33, H_2O 12·17, 99·78. Heating curve gives endothermal breaks at 0°–200°C and 550°–870°C, and an exothermal break at 0°–870°. [A.M. **44**–907] S. I. T.

HAN (ZDENĚK). *Koutekite : a new mineral.* Nature, 1958, **181**, 1553–1554.

A new mineral has been found in gangue from Černy Důl Krkonoše (Giant Mountains), Bohemia, associated with senic, silver, smaltite, löllingite, chalcocite, and other nerals. Synthetic material of composition very close to Ni_2As had an identical X-ray pattern and optical properties. is bluish grey under the microscope, strongly anisotropic, d has a strongly lamellar texture. The synthetic material d sp. gr. 8·48 : symmetry may be hexagonal. The new ineral is named *koutekite* after J. Koutek, Professor of conomic Geology, Charles University, Prague. Koutekite curs intergrown with another copper arsenide designated ineral X. [A.M. **43**–794] R. A. H.

RENZEL (GERHARD). *Ein neues Mineral : Idait.* Neues Jahrb. Min., Monatshefte, 1959, 142.

A preliminary note of a new ore mineral *idaite*, composi- on Cu_5FeS_6, related to covelline ; symmetry hexagonal, ith a 3·90, c 16·95Å, $Z=1$, space group $D_{6h}(?)$; sp. gr. 4·21, . 2½ ; metallic lustre, colour similar to that of bornite. n reflected light it shows a strong birefringence : colour in r, ω reddish orange to red-brown, slightly darker than ornite ; ε bright yellowish grey, brighter than fresh bornite, arker than chalcopyrite. The mineral is named after the da Mine, Khan, South-West Africa, where it occurs as mellae intergrown with bornite, often together with fine oindles of chalcopyrite. R. A. H.

TRUNZ (H.), GEIER (B. H.), & SEELIGER (E.). *Gallit, $CuGaS_2$, das erste selbständige Galliummineral, und seine Verbreitung in den Erzen der Tsumeb- und Kipushi-Mine.* Neues Jahrb. Min., Monatshefte, 1958, 241–264, 21 figs.

Grey metallic grains and inclusions in germanite, reniérite, sphalerite, and other ore minerals from the Tsumeb mine, South-West Africa, are recognised as a new mineral : it is the first known gallium mineral and the name *gallite* is proposed. Spectrographic analysis indicated that the chief metal components are Cu and Ga approximately in the ratio 1 : 1. The X-ray powder pattern is similar to that of chalcopyrite, and identical with that of the synthetic compound $CuGaS_2$. Chem. anal. of gallite concentrates confirmed the presence of major amounts of Cu, Ga, and S with minor Pb, Zn, and Fe : the formula is taken to be $CuGaS_2$. It is tetragonal, a 5·35, c 10·48Å, $Z=4$, probable space group D^{12}_{2d}–$I\bar{4}2d$, and has a metallic lustre, streak grey to black, H. 3–3½, sp. gr. 4·40 ; twinning occurs on {112} ; reflecting power 26% in air, 13% in oil. The indexed X-ray powder reflections are tabulated and 20 microphotographs are given of polished sections. A second occurrence is recorded from the Kipushi mine, Katanga, Belgian Congo. [A.M. **44**-906] R. A. H.

KOCH (S.). *The associated occurrence of three ZnS modifications in Gyöngyösoroszi.* Acta Univ. Szegediensis, 1958, **11**, 11–22, 5 figs., 3 pls.

In the Miocene subvolcanic epithermal Zn–Pb veins of Gyöngyösoroszi, Mátra Mountains, Hungary, all three crystalline varieties of ZnS occur together, along with galena, pyrite, and chalcopyrite. The wurtzite occurs in veins rich in quartz and is normal 2H wurtzite : chem. anal. by E. Klivényi gave Zn 61·69, Fe 4·64, S 33·36, SiO_2 0·63, =100·32. Yellowish brown crystal aggregates, sometimes associated with wurtzite prisms or a polysynthetic spinel twin of sphalerite, are identified as the first natural occurrence of β′–ZnS–3R [Buck & Strock, 1955, A.M. **40**–192] : chemical analysis of selected pyramidal crystal aggregates by E. Klivényi gave Zn 61·70, Fe 5·10, S 33·22, =100·02. The name *mátraite* is suggested for this variety, after the Mátra Mountains. R. A. H.

SASVÁRI (K.). *ZnS mineral with ZnS–3R crystal structure.* Acta Univ. Szegediensis, 1958, **11**, 23–27, 1 fig.

Yellowish-brown ZnS crystal needles associated with sphalerite from Gynögyösoroszi [see preceding abstract] yielded X-ray oscillation photographs which gave a 3·8, c 9·4Å. This corresponds to the hexagonal cell which can be placed in the sphalerite lattice (a 5·412Å). The crystal needles are about 0·1 mm thick and 1 mm long and show moderate double refraction. The oscillation photographs indicate the presence of twinning on (0001). This is the first case in which it has been possible to identify the ZnS–3R modification in nature. [M.A. **11**–125, **12**-91, **13**–267] R. A. H.

[Ivanov (V. V.) & Pyatenko (Yu. A.)] Иванов (В. В.) и Пятенко (Ю. А.). О так называемом кёстерите. [*On the so-called kusterite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 165–168, 2 figs.

In 1948 A. I. Kiselev described a new mineral from Kuster, Yakutian region, Siberia, which was later called *kusterite* by V. N. Soboleva. A detailed account of this mineral is now presented. Kusterite is found in the form of small grains or large crystals in pegmatite and quartz veins. It is iron-black in colour with metallic lustre and adamantine in fracture, H. 4·43, sp. gr. 4·54–4·59. Chem. anal. gave : Cu 30·56, Ag 0·005, Zn 11·16, Fe 1·68, Mn 0·07, Sb 0·90, Sn 25·25, S 28·40, Se 0·01, =98·03, corresponding to a simplified formula $Cu(Zn_{0\cdot77}.Fe_{0\cdot23})SnS_4$. X-ray anal. gave : tetragonal body-centred lattice a 5·43, c 10·86Å.

S. I. T.

Guillemin (C.) & Protas (J.). *Ianthinite et wyartite.* Bull. Soc. franç. Min. Crist., 1959, **82**, 80–86, 5 figs.

Specimens of 'ianthinite' found on uraninite from Shinkolobwe, Katanga, are shown to include two distinct mineral species. The ianthinite of Schoep [M.A. **4**–313, **10**–145] occurs in acicular orthorhombic crystals with a 11·52, b 7·15, c 30·3Å, $Z=4$; $\alpha \parallel c$ (colourless) 1·685, $\beta \parallel b$ (purple) 1·91, $\gamma \parallel a$ (violet) 1·93, $2V\alpha$ 58°. The formula approximates to $UO_2.5UO_3.10{\cdot}56H_2O$.

The 'ianthinite' of Bignand [M.A. **12**–587] is a new species now named *wyartite* in honour of Prof. J. Wyart of the Sorbonne. Wyartite forms orthorhombic crystals tabular on {001}, elongated on [010], with forms {001} and {110}?. The {001} faces are strongly striated ‖ [010] ; cleavage {001} perfect, {010] poor, parting on {100} ; H. 3–4 ; sp. gr. 4·69 ; a 11·25, b 7·08, c 20·98Å, $Z=2$; black to violet-black, opaque to translucent ; $\alpha \parallel c$ (grey), $\beta \parallel b$ (violet) 1·89, $\gamma \parallel a$ (lavender blue) 1·91 (colour in thin section), $2V\alpha$ 48°. Chem. anals. indicate a formula close to $UO_2.6UO_3.2CO_2.3CaO.12–14H_2O$. X-ray powder data tabulated for both ianthinite and wyartite ; d.t.a. curves given. [A.M. **44**–908, 1103]

R. A. H.

[Buryanova (E. Z.)] Бурьянова (Е. З.). Новый водный силикат урана — билибинит. [*A new hydrous uranium silicate–bilibinite.*] Зап. Всесюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (6), 667–674, 2 figs.

A new mineral, named *bilibinite* (after Yu. A. Bilibin) is a black amorphous mineral forming aggregates cementing sandstone (locality not given). It has a pitchy lustre, conchoidal fracture, H. 3–4, opaque, refr. ind. $>1{\cdot}782$, $<1{\cdot}820$. The black bilibinite in the oxidation zone shows gradual transition from greenish to yellowish material. Chem. anal. gave SiO_2 14·80, ThO_2 1·48, UO_2 5·07, UO_3 45·89, TR_2O_3 3·19, CaO 1·70, BaO 0·25, PbO 3·60, H_2O+ 3·23, H_2O- 4·[illegible] insol. res. 16·33, =100·44. This corresponds to an empir[ical] formula $3(Ca,Pb,TR)O.(U,Th)O_2.7UO_3.10SiO_2.19H_2O$. Fr[esh] bilibinite did not produce a diffraction pattern with X-r[ays] but bilibinite heated at 980°C gave distinct lines, [the] numerical data for which are given in a table. The diffr[ac]tion pattern is that of crystalline U_3O_8. Thermal anal[ysis] suggests that water is given out at 140–180°C. It is s[ug]gested that bilibinite is an amorphous analogue of coffi[nite] and nenadkevite, and one end member of a series of thoriu[m] uranium silicates, which is as follows : bilibinite-ma[lan]landite-nicolayite-pilbarite. [A.M. **44**–692]

S. I. T.

[Serdyuchenko (D. P.)] Сердюченко (Д. П.). Кальц[ий]талькновый минерал. [*Calciotalc—a new miner[al]*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. So[c.] 1959, **88** (3), 298–304.

Calciotalc (A) occurs as a replacement product of acti[no]lite (B) and is followed by normal talc (C) in the phlogop[ite] deposit of the Medviezhy stream in the basin of the ri[ver] Leglier, Aldan region of southern Yakutia.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2
A	50·94	0·16	4·82	1·40	7·30	0·11	18·65	12·71	0·58	0
B	60·94	tr	0·23	0·80	2·16	0·04	20·00	11·18	0·29	
C	58·68	0·04	1·15	1·23	3·85	0·01	27·26	1·43	0·18	

	CO_2	F	Cl	H_2O+	H_2O-	BaO	Li_2O	Total	α	γ	γ :
A	abs	1·18	0·16	0·91	0·24	0·04	0·05	100·05	1·627	1·652	21
B	abs	—	—	3·40	0·98	—	—	100·02	1·565	1·585	0
C	abs	—	—	5·10	1·11	—	—	100·04	1·540	1·588	—

Calciotalc is a compact and relatively hard mine[ral] (H. >2), has a greenish-grey colour and weak, silky-pea[rly] lustre. It is biaxial, negative with small 2V. The X-r[ay] data, as compared with talc, show slight expansion along [See following abstract]

S. I. T.

[Belov (N. V.)] Белов (Н. В.). О кальциотальке Д. Сердюченко. [*On calciotalc of D. P. Serdyuchenk[o]*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc. 1959, **3**, 305–308, 2 figs.

The mineral named 'calciotalc' is better named 'ma[g]nesium margarite', as its formula is $CaMg_2Si_4O_{10}(OH)$ which can be obtained from muscovite by the replaceme[nt] of Al-octahedra by Mg-octahedra. A suggested structure [is] given. [See previous abstract]

S. I. T.

[Ankinovich (E. A.)] Анкинович (Е. А.). Новые ван[а]диевые минералы — сатпаевит и альванит. [*N[ew] vanadium minerals—satpayevite and alvanite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc. 1959, **88** (2), 157–164, 6 figs.

These two new minerals are found in the oxidized zo[ne] of an argillaceous anthraxolitic vanadium-bearing depo[sit] of Kurumsak and Balasanskandyk in Karatau, Kazakhsta[n]. *Satpayevite* (after K. I. Satpayev) is an earthy mineral

ow colour, sp. gr. 2·4, H. 1·5–2·0, isotropic or weakly otropic, flakes of yellow-green or olive-green colour, kly pleochroic, α′ 1·676, γ′ 1·69, 2V 70°, easily soluble cids. Chem. anal. gave: CaO 1·70, MgO 1·20, Al_2O_3 00, Fe_2O_3 0·25, SO_4 1·40, V_2O_4 7·40, V_2O_5 27·70, H_2O+ 30, H_2O- 4·10, =98·55. Corresponding formula: $_2O_3.V_2O_4.3V_2O_5.30H_2O$. The thermal curves of satevite and steigerite are comparable but the X-ray data hese two minerals are quite distinct.

Ulvanite (named after its composition) occurs as small nded aggregates found in cracks and cavities. Under microscope it is seen to be made of small rosettes of ty crystals of a light bluish-green colour, monoclinic, 15°, faces (001), (010), (100), and (101), sp. gr. 2·41. 3–3·5, soluble in acids, α 1·658, γ 1·714, 2V (—) 80–85°, ong axial dispersion $r<v$. Chem. anal. gave: CaO 0·5, O 0·5, ZnO 0·5, Ni 2·7, Al_2O_3 39·6, Fe_2O_3 tr., V_2O_3 abs., $_2$ 1·8, V_2O_4 3·7, V_2O_5 24·1, H_2O+ 25·6, H_2O- 0·4, al 99·4. Corresponding simplified formula: $(VO_4)(OH)_6.2{\cdot}5H_2O$. X-ray data are given. S. I. T.

NOSHITA (K.), TANAKA (N.), & HONDA (T.) *Nickeliferous clay mineral from Niū mine, Ōita Prefecture.* Journ. Min. Soc. Japan, 1958, **3**, 468–477, 2 figs., 3 pls. (in Japanese): English summary, ibid., 791–792).

A pale blue, soft clay mineral previously thought to be nierite is now considered to be equivalent to nickelntmorillonite, with Ni partly replacing Mg rather than ing merely absorbed. The d.t.a. curve and X-ray powder ta are given. Chem. anal. gave SiO_2 53·07, Al_2O_3 16·03, $_2O_3$ 0·94, FeO nil, MnO tr., CaO 2·47, MgO 5·50, NiO 1·45, $_2O$ 0·10, K_2O tr., H_2O- 9·74, H_2O- 10·52, =99·82; .c. 61 me/100 g. The coexisting dolomite and opal ntain a small amount of nickel. R. A. H.

ss (J.). *Uraniferous chromium ore and its paragenetic role in the Mecsek Permian aggregate.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 396–401, 5 figs.

A green feldspathic Permian sandstone contains Cr,U,Ba, d V. The Cr, V, and U occur in an emerald-green mica nich replaces the sericitic cement or occurs in fissures; it occasionally interlaced with soddyite [not soddite]. The ica is dioctahedral with small 2V (—). On exposure to -rays it turns brown, darkens, and gives diffuse powder nes. On heating to 1000°C it turns brownish red and comes uniaxial (—). Chem. anal. gave SiO_2 48·61, TiO_2 01, Al_2O_3 17·25, Fe_2O_3 3·00, Cr_2O_3 10·58, V_2O_5 1·81, NiO 15, CaO tr., MgO 2·69, K_2O 7·48, Na_2O 0·03, H_2O+ 5·77, $_2O-$ 2·67, P_2O_5 tr., U 0·03, =100·08. D.t.a. showed ndothermal breaks at 100–150° and 200–290°C. The mineral cannot be identified with fuchsite, avalite, or mariposite. The role of Cr as an accumulator of U is discussed. R. K. H.

STRUNZ (H.), SÖHNGE (G.), & GEIER (B. H.). *Stottit, ein neues Germanium-Mineral, und seine Paragenese in Tsumeb.* Neues Jahrb. Min., Monatshefte, 1958, 85–96, 7 figs.

Stottite, the first known germanate mineral, occurs with tennantite and reniérite at the Tsumeb mine, South-West Africa. It is brown in colour, with ε 1·728, ω $1{\cdot}737_5$; sp. gr. 3·596, H. $4\frac{1}{2}$; symmetry tetragonal-dipyramidal, a 7·55, c 7·47Å, c/a 0·989, $Z=4$, space group C_{4h}^4—$P4_2/n$; forms present are {111}, {100}, {110}, {101}, {102}, and {001}. Chem. anal. by Fresenius gave GeO_2 41·75, FeO 34·81, MnO 0·88, MgO 0·46, CaO 0·34, H_2O 21·84, =100·08 leading to the ideal formula $Fe^{2+}H_2[GeO_4].2H_2O$; soluble in 20% HCl. The name is in honour of Mr. Charles E. Stott, general manager of the Tsumeb Corporation, Ltd. The mineral paragenesis of the Tsumeb mine is reviewed. [A.M. **43**–1006] R. A. H.

[ANDREEV (YU. K.)] Андреев (Ю. К.). Новая разновидность шелочного амфибола—магнезио-арфведсонит [*A new variety of alkali-amphibole—magnesia-arfvedsonite.*] Труды института геологии рудных месторождении, петрографии, минералогии и геохимии [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **10**, 12–50, 5 figs.

The fibrous mineral described is found in serpentinite transformed into a talc-chlorite-carbonate rock near a granite intrusion. Its colour is pale bluish with greenish tinge; α 1·633, β 1·640, γ 1·642, β : c 6°, elongation ±, pleochroism α light yellow, β light green with bluish tinge; sp. gr. 3·045. Chem. anal. gave SiO_2 55·36, TiO_2 0·02, Al_2O_3 0·42, Fe_2O_3 10·28, FeO 2·28, MnO tr., MgO 17·58, CaO 1·28, Na_2O 7·80, K_2O 1·78, H_2O+ 3·16, H_2O- 0·72, Cr_2O_3 0·23, NiO 0·15, CO_2 abs., S tr., F 0·04, ='100·68'. The ideal formula is $Na_3Mg_4Fe^{3+}Si_8O_{22}(OH)_2$. This mineral is intermediate between arfvedsonite and eckermannite. [A.M. **43**–797] S. I. T.

VAN WAMBEKE (L.). *Contribution à l'étude de la minéralisation radioactive de la pegmatite de Kobokobo et description d'une nouvelle espèce minérale radioactive de la série phosphuranylite-renardite : la kivuite.* Bull. Soc. belge Géol., 1958, **67**, 383–403, 1 fig.

Kivuite is found associated with phosphuranylite, renardite, cyrtolite, columbotantalite in nests or as coating in mineralized pegmatite from Kobokobo, Kivu province, Belgian Congo. (The name is from the province). It occurs as yellow powder, showing, under the microscope, plates

with positive elongation, α 1·618 (colourless), β 1·654–1·655, γ 1·655 (β and γ deep yellow green), birefr. 0·035, uniaxial or biaxial ($2V\alpha$ 0 to 5°), $r>v$. According to its X-ray diffraction pattern kivuïte is isostructural with phosphuranylite and renardite ; orthorhombic cell with a 15·88, b 17·24, c 13·76Å ; space group *Bmbm*. Anal. by E. Poncin gave UO_3 62·90, ThO_2 8·32, PbO 1·84, CaO 0·60, P_2O_5 6·04, H_2O (110°C) 6·24, H_2O (450°C) 8·09, =94·03, the rest is cyrtolite and columbotantalite. X-ray fluorescence analysis shows in addition 0·1–0·2% BaO and As_2O_5. Probable formula $ThH_2(UO_2)_4(PO_4)_2(OH)_8.7H_2O$. A *lead-bearing kivuïte* is also reported. Other described minerals are : uraninite, autunite, torbernite, rutherfordine. [M.A. **14**–52, 59] R. V. T.

Van Wambeke (L.). *Application of X-rays to the investigation of radioactive mineralizations*. Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 541–549, 5 figs.

The X-ray techniques of diffractrometry and fluorescence analysis are briefly described. Applications to the study of radioactive mineral deposits in the Belgian Congo are outlined ; these include the bastnäsite-bearing lodes of the Urundi, small pitchblende veins in the Ruanda, and the Kobokobo pegmatite in the Kivu, in which many of the secondary U-minerals are thoriferous. A new mineral, *kivuïte* [see preceding abstract], is a member of the phosphuranylite group with the probable formula $ThH_2(UO_2)_4(PO_4)_2(OH)_8.7H_2O$ and is orthorhombic with a 15·88±0·05, b 17·23±0·08, c 13·76±0·05Å. The value of X-ray methods for determining metamict minerals, evaluating alluvial concentrates, and in geochemical prospecting is also stressed. J. E. T. H.

Van Wambeke (L.). *Une nouvelle espèce minérale : la lusungite en provenance de la pegmatite de Kobokobo (Kivu-Congo belge)*. Bull. Soc. belge Géol., 1958, **67**, 162–169.

Lusungite occurs as a deep brown coating associated with limonite in a phosphate-rich zone of an uraniferous pegmatite [M.A. **14**–52, 59]. Under the microscope yellow-brown, very weakly pleochroic, sometimes of lozenge shape. Probably uniaxial, positive ; birefr. 0·03 to 0·04, refr. ind. variable 1·77 to 1·855. X-ray powder data indicate that lusungite is isostructural with hidalgoite, svanbergite, and plumbogummite ; hexagonal cell a 7·04±0·007, c 16·80± 0·01Å, c/a 2·386 ; rhombohedral cell a 6·92Å, α 61° 12′. Space group $R3m$. X-ray fluorescence gave Fe, Pb, Sr, and P as major constituents, Ba and Ca <3%, Al and As <1%, S absent. Formula admitted : $(Sr,Pb)Fe_3(PO_4)_2(OH)_5H_2O$. Only 1 mg material was available for study. The name is from the river Lusungu, near Kobokobo. [A.M. **44**–906] R. V. T.

Geier (B. H.) & Weber (K.). *Reinerite $Zn_3(AsO_3)_2$ ... neues Mineral der Tsumeb Mine Südwestafrika*. N... Jahrb. Min., Monatshefte, 1958, 160–167, 3 figs.

The new mineral *reinerite* [not to be confused ... reniérite, $Cu_3(Fe,Ge,Zn)(As,S)_4$, from the same locality] described from the Tsumeb mine, South-West Africa. ... occurs in sea-blue to pale yellow-green, orthorhom... crystals, with {010}, {110}, {001}, and {012} ; a 6·... b 14·397, c 7·804Å, $Z=4$, space group D_{2h}^{5} ; D 4·27/g/c... H. 5–5½ ; α 1·749, β 1·790, γ 1·821. Chem. anal. by ... Reiner gave for the sea-blue material ZnO 53·27, FeO 1... Cu 2·23, As_2O_3 42·51, (S nt. det.) ='99·76', and for the l... green variety ZnO 56·01, As_2O_3 43·83, =99·84, leading to ... formula $Zn_3(AsO_3)_2$. The indexed X-ray powder reflect... are tabulated. The name is in honour of Mr. Willy Rei... senior chemist of the Tsumeb Corporation, Ltd. [A... **43**–1006, **44**–207] R. A. H...

[Belova (L. N.)] Белова (Л. Н.). Арсенуранилит — мышьковый аналог фосфуранилита. [*Arsenuranylite — arsenic analogue to phosphuranylite.*]- Зап. Всесо... Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 598–602, 1 fig.

Arsenuranylite is similar in appearance to the lichen-... aggregates of phosphuranylite, but differs from it by dee... orange colour. Under the microscope this mineral appe... as minute yellow scales without any significant pleochroi... α' 1·737, γ' 1·766. Chem. anal. gave UO_3 68·64, CaO 3... As_2O_5 16·68, H_2O 9·15, = 97·95. The corresponding form... is $Ca(UO_2)_4(AsO_4)_2(OH)_4.6H_2O$ and the generalized form... for the group is $A(UO_2)_4(XO_4)_2(OH)_4.nH_2O$ in wh... A=Pb,Ca, X=P,As. The X-ray data for arsenuranyli... phosphuranylite, and renardite are similar, and are re... ectively : a 15·40, 15·85, 16·01, b 17·40, 17·42, 17·5, c 13·7... 13·76, 13·7Å respectively. [A.M. **44**–208] S. I. T...

Thompson (M. E.) & Sherwood (A. M.). *Delrioite, a ... calcium strontium vanadate from Colorado*. Amer. M... 1959, **44**, 261–264.

Delrioite, $CaO.SrO.V_2O_5.3H_2O$, occurs as an efflorescen... on sandstone on a dump of the Jo Dandy mine, Montr... County, Colorado, U.S.A. It occurs in radial aggrega... of pale yellow-green, acicular crystals. X-ray powder da... give a unique pattern, the major lines are 6·5 (*S*), 4·95 (*M*... 4·40 (*M*), 3·55 (*M*), 3·45 (*MS*). Delrioite is biaxial negat... with α 1·783, β 1·834, γ 1·866, all ±·003, pleochroi... α colourless, β pale yellow, γ medium yellow ; H. 2, sp. ... 3·1±0·1. Microchemical analysis gave CaO 13·30, S... 24·50, V_2O_5 46·00, H_2O+ 5·64, H_2O- 9·24, SiO_2 1·30 ... admixed quartz), =99·98. B. H. B...

ENRIETH (H.) & BRAUNE (G.). *Ein neues Salzmineral, seine Eigenschaften, sein Auftreten, und seine Existenzbedingungen im System der Salze ozeanischer Salzablagerungen.* Naturw., 1958, **45**, 362–363.

new stable phase has been found to separate from tions saturated with NaCl. Its composition is $SO_4.3NaCl.9Na_2SO_4$, i.e. close to but distinct from lksite. The mineral is cubic, sp. gr. 2·655, n 1·489 (Na t) ; $Z=4$, a 15·90Å. It is to be expected in association h thenardite and vanthoffite and is probably identical h a phase found by Görgey in 1909. If confirmed as a ural mineral, it *should be called D'Ansite* in honour of fessor J. D'Ans. A. G. C.

TES (ALBERT F., *Jr.*) & HADD (GEORGE A.). *Geology of the Jomac mine, White Canyon area, San Juan County, Utah.* Bull. U.S. Geol. Survey, 1958, **1046-H**, 165–181.

Uranium minerals at the Jomac mine include metanerite (pale-green plates up to 2 mm across), an unntified fibrous yellow mineral which fluoresces with an ense yellowish green color and which semiquantitative ctrographic analysis suggests as a silicate, and an dentified massive yellow mineral (in nodular porlaneous masses up to 15 mm wide) the X-ray powder ttern of which matches none of the standard uranium nerals in the files of the Geological Survey. Sulfide minerals include chalcopyrite and pyrite ; secondary copper minerals include malachite, azurite, and chalcanthite ; and gangue minerals include hydrous iron oxides, hematite, jarosite, gypsum, and manganese oxides. K. S.

TEMPLE (A. K.). *The Leadhills-Wanlockhead lead and zinc deposits.* Trans. Roy. Soc. Edin., 1956, **63**, 85–113, 9 figs., 1 pl.

The 57 minerals reported from these deposits include, among the secondary minerals, three new species or varieties. A *new chromium mineral*, unnamed, associated with cerussite from Hopeful Vein, occurs in elongated bright red crystals. It contains 6 to 15% Cr and has an X-ray diffraction pattern similar, but not identical, to that of lanarkite, but with a larger unit cell. *Chromian leadhillite*, a new variety, is also found in Hopeful Vein, and occurs in orange to red elongated crystals associated with lanarkite and cotunnite. The orange material had 0·5% Cr : the X-ray diffraction pattern is that of leadhillite but with a larger unit cell probably due to partial substitution of Cr^{6+} for S^{6+}. *Lead hydroxyapatite*, $Pb_5(PO_4)_3(OH)$, previously recorded only as an artificial mineral, is reported from Whyte's Cleugh, associated with polysphaerite. R. A. H.

Unnamed new vanadium-bearing minerals, *see* Ross (MALCOLM), p. 275.

ROCK-FORMING MINERALS AND PETROLOGY

Rock-forming minerals

URIEVA (E. Y.)] Гурьева (Э. Я.). О некоторых графических срастаниях кварца с полевыми шпатами в пегматитах Мамского района. [*On certain graphic intergrowths of quartz with feldspars in the pegmatites of the Mama region.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **10**, 74–84, 10 figs.

Quartz-feldspar intergrowths were studied on the Fedorov age. Statistical fabric diagrams revealed four laws of tergrowth of quartz with plagioclase, and three with icrocline. S. I. T.

ASILKOVA (N. N.)] Василькова (Н. Н.). Метастабильный калиевый полевой шпат и цеолит в рудах Дальнетаежного месторождения. [*Metastable potassium feldspar and zeolite in the ores of Dalnetaezhny deposits.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Geol. Ser.], 1959, **5**, 113–118, 4 figs.

The association of potash feldspar and zeolite from a ssiterite ore from the Far East is described. The feldspar curs in two generations, that of the first generation has 2V varying from 0° to 90°, that of the second generation has 2V varying mostly from 50° to 90°. This suggests that a metastable sanidine-like variety of feldspar is changed during the process of ore formation into an adularia. The abundant zeolite is a calcium β-leonhardite. Its chemical composition is SiO_2 52·04, Al_2O_3 21·46, Fe_2O_3 0·12, CaO 11·41, Na_2O 0·20, K_2O 0·66, H_2O 13·80, =99·69 ; α 1·507, β 1·516, γ 1·518, $2V_\alpha$ 26°±4°, $\gamma : c$ 32°. S. I. T.

HEWLETT (C. G.). *Optical properties of potassic feldspars.* Bull. Geol. Soc. America, 1959, **70**, 511–538, 5 figs.

Optical and X-ray studies of 15 analysed feldspars show that variations in chemical composition, degree of unmixing, and state of order–disorder of Si/Al in potassic feldspars are reflected as variations in the optical properties. Refractive indices are not useful for determining chemical composition. Although α seems to be independent of the degree of Si/Al ordering, substitution of Na for K causes such a small index increase in the range $Or_{100}Ab_0$ to $Or_{60}Ab_{40}$ that its effects are normally masked by the larger increase due to substitution of minor amounts of Ca, Sr, Ba, and Fe. The decrease in α when cryptoperthites are homogenized at 850°C is a measure of the degree of unmixing. The angle

2V and the difference between α and the refr. ind. of the ray vibrating nearly $\parallel b$ provide a measure of the degree of Si/Al ordering, providing the composition is known. Most existing diagrams relating optical properties to composition of alkali feldspars are constructed for groups of feldspars with the same state of Si/Al ordering and do not indicate the importance of degree of unmixing in determining refractive indices. These diagrams are valid only if the state of order varies sympathetically with the degree of unmixing. A. L. A.

MacKenzie (W. S.) & Smith (J. V.). *Charge balance and the stability of alkali feldspars.* Acta Cryst., 1959, **12**, 73–74.

Conclusions by Ferguson, Trail, & Taylor [M.A. **14**–103] based on structure determination of high- and low-albite, are criticized. Argument concerns the relative stabilities of microcline, orthoclase, and sanidine as deduced by a consideration of (a) long range charge balance, (b) local charge balance, (c) mineralogical and petrological evidence. [M.M. **24**–453, **30**–354 ; M.A. **12**–333, 527, **13**–309] J. Z.

[Plamenevskaya (N. L.)] Пламеневская (Н. Л.). О явлении амазонитизации в Майкульской гранитной интрузии (Юго-западное Прибалхашье). [*Phenomena of amazonitization in the Maikulskaya granite intrusion (south-western sub-Balkhash region.)*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **5**, 47–55, 5 figs.

Spectroscopic, optic, and chemical study of potash-soda feldspars suggests that the pink and green colour of certain feldspars is due to the presence of iron. In the granite studied the process of albitization was followed by cassiterite mineralization, and this in turn by the process of amazonitization of alkali feldspars. S. I. T.

[Lebedev-Zinoviev (A. A.)] Лебедев-Зиновьев (А. А.). Полевые шпаты олигоклазовых гранит-порфиров горы Бык на Северном Кавказе. [*Feldspar of oligoclase granite-porphyries of Mt. Byk in North Caucasus.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 172–177, 3 figs.

Optical statistical study of oligoclase phenocrysts and especially the plots of the twin axes of albite law and other twin laws, as well as the optic axial angle, show clearly that these feldspars belong to the high-temperature type. S. I. T.

Smith (J. R.). *The optical properties of heated plagioclases.* Amer. Min., 1958, **43**, 1179–1194, 3 figs., 3 tables, appendix with 2 tables.

The indices of refraction and 2V of nine chemic analysed samples of natural plagioclase have been de mined to $\pm 0{\cdot}0003$ and $\pm 0{\cdot}5°$ respectively, before and a changing them to the high-temperature modification heat treatment. After heating, α changes slightly and β γ measurably from An 0 to An 20, but from An 20 to An there is negligible change in any index. Determination α, β, and γ gives reliable information on the composit but not on the structural state. If 2V is measured addition then low- and high-temperature forms can distinguished in the ranges An 0 to An 40 and An 60 An 90. To minimize glass formation hydrothermal rat than dry heating was necessary between An 44 and An for five samples. B. H. B

[Zavaritzky (A. N.), Sobolev (V. S.), Kvasha (L. Kostuk (V. P.), & Bobrievich (A. P.)] Заварицк (А. Н.), Соболев (В. С.), Кваша (Л. Г.), Костюк (В. и Бобриевич (А. П.). Новые диаграммы для оп деления состава высокотемпературных плагиоклаз [*New diagrams for the determination of composition high-temperature plagioclases.*] Зап. Всесоюз. Ми Общ. [Mem. All-Union Min. Soc.]. 1958, **87** (529–541, 7 figs.

Coordinates and migration curves for the principal m phological directions have been calculated and construct for plagioclases ranging from An_{100} to An_{35}. A review literature on the subject of high-temperature plagiocla is given together with a bibliography. S. I. T

[Marfunin (A. S.)] Марфунин (А. С.). Эмпирическ уравнение зависимости среднего светопреломлен плагиоклазов от состава [*An empirical equati expressing the dependence of the mean index of fraction on the composition of plagioclase.*] За Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 19 **3**, 346–348.

Recalculation of much data for plagioclases shows line relationship between the average refr. ind., $N_{av} = (\alpha$ $\beta+\gamma)/3$, and the anorthite percentage. The formul are $N_{av} = 0{\cdot}00051\ An\% + 1{\cdot}5322$, and $An\% = 1960{\cdot}78\ N_{av}$ $3004{\cdot}31$. S. I. T.

[Isokh (E. P.) & Kazitzin (Yu. V.)] Изох (Э. П.) Казицын (Ю. В.). Структурная прерывистость в ря альбит-анортит и петрографическое значение плаги клазов различного структурного типа. [*Structur discontinuity in the albite-anorthite series and t petrographic significance of plagioclase of differe structural type.*] Зап. Всесоюз. Мин. Общ. [Mem. A Union Min. Soc.], 1959, **3**, 247–260, 6 figs.

review of recent literature shows that the evidence of ay, crystal optics, and thermo-chemical studies, clearly ıts to structural discontinuities in the series of the -temperature' plagioclases. The following structural es are distinguished : (1) albite type from 0 to 30–35% ranging through (a) region of true isomorphism (0 to An), (b) region of immiscibility (peristerites, 5 to 17%), (c) region of true isomorphism (17 to 30–35% An) : intermediate type an alteration of layers of albitic and rthitic structures from 30–35 to 70% An ; (3) anorthite e, a region of true isomorphism from 70 to 100% An), body-centred cell (70% An and higher), (b) primitive l (100% An and less). The implications of such a division the low-temperature plagioclases to the classification of ıtonic igneous rocks and to their mode of formation are cussed. S. I. T.

IMODA (N.). [*Geochemical investigations on the pegmatite minerals. III. The relation between stages of crystallization and chemical composition of micas in the Yamanoo pegmatite of Makabe-Machi, Makabe-Gun, Ibaraki Prefecture.*]. Nippon Kagaku Zasshi, 1955, **76**, 1248–1251, 3 figs.

Chemical analyses are given for three muscovites and two n-rich biotites from the Yamanoo pegmatite and the riation in their chemistry with position in the pegmatite discussed. B_2O_3 varies from 60 to 260 p.p.m. in the uscovites but amounts to only 3 p.p.m. in the biotites : ı ranges from 260 to 300 p.p.m. R. A. H.

ASON (BRIAN). *The intrusive rocks of the Kaikoura mountains, Marlborough, New Zealand.* Trans. Roy. Soc. New Zealand, 1958, **85**, 247–262, 9 figs.

The rocks described are mainly hornblende-bearing bbros accompanied by numerous minor intrusions cluding camptonites, analcime tinguaites or monchiquites, ıd nepheline syenite aplites. Their mineralogy and trology are described, and chemical analyses by H. B. iik, with trace element data by S. R. Taylor, of a hornende gabbro, a camptonite, and a nepheline syenite olite are given. Basalts occurring in the same general ea are briefly described and an analysis given. Brown rnblende (A) from the gabbro has α 1·676, β 1·695, γ 1·705, $2V_\alpha$ 74°, $\gamma : c$ 12°, pleochroism α pale brown, $\beta = \gamma$ dark ddish brown. Biotite (B) co-existing with the hornblende as α 1·624, β 1·673, γ 1·674, $2V_\alpha$ 10°, pleochroism α pale ellow, $\beta = \gamma$ brown-black. Anal. by M. E. Coller :

	SiO_2	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O+	Total
	38·0	4·13	15·0	11·70	11·43	11·74	2·80	1·48	1·40	99·66
	35·1	4·05	17·8	17·94	10·07	2·35	1·09	7·74	2·46	99·37

otals include Fe_2O_3 1·69, 0·24 ; MnO 0·25, 0·29 ; H_2O- 0·04, 0·24 for A and B spectively.

W. A. W.

WATTERS (W. A.). *An association of hornblende and cummingtonite from Ringaringa, Stewart Island, New Zealand.* New Zealand Journ. Geol. Geophys., 1959, **2**, 248–256, 2 figs.

Hornblende and cummingtonite occurring in an amphibolite of igneous origin are described. The hornblende (A) has α 1·648, β 1·659, γ 1·668 (all $\pm$0·003), $2V_\alpha$ 72°–75°, $\gamma : c$ 15°, pleochroism α light yellow-green, β leaf-green to olive-green, γ blue-green ; the cummingtonite (B, anal. re-calcd. allowing for impurities of hornblende) has α 1·641, β 1·650, γ 1·667 (all $\pm$0·003), $2V_\gamma$ 79°–83°, $\gamma : c$ 18°, disp. slight $r > v$. Associated biotite gives α 1·597, γ 1·651 (both $\pm$0·003), pleochroism α light straw-yellow, $\beta = \gamma$ dark chocolate brown. The analyses are plotted to show the extent of a suggested miscibility gap between associated hornblendes and cummingtonites. The paragenesis of the two amphiboles is briefly discussed. A short appendix describes the method of separation of the amphiboles from the crushed rocks.

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MgO	CaO	Na_2O	H_2O+	Total
A	45·88	8·83	0·69	4·45	14·64	10·90	10·92	0·98	2·13	100·38
B	52·05	0·77	0·60	3·40	22·35	15·26	1·89	0·21	1·98	99·99

Totals include MnO 0·65, 1·41 ; K_2O 0·31, 0·07 for A and B respectively.

J. Ph.

[VINOGRADSKAYA (G. M.)] Виноградская (Г. М.). Амфибол из гранито-гнейса Губенского массива на Южном Урале. [*An amphibole from granite-gneiss of the Goubensky massif in the Southern Urals.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 60–71, 1 fig.

The amphibole, up to 5 mm long, is of black colour, transparent only on thin edges, sp. gr. 3·46, prismatic cleavage 57°, α 1·691, γ 1·708, 2V (—) 35°, $\gamma : c$ 23°, pleochroism α yellowish-green, β dark green, γ bluish green, $r > v$. Analysis : SiO 37·00, TiO 0·59, Al_2O_3 11·29, Fe_2O_3 11·86, FeO 19·96, MnO 0·87, MgO 2·16, CaO 10·49, Na_2O 1·18, K_2O 1·98, F 0·58, H_2O+ 2·55, H_2O- 0·40, = 100·91, O for F 0·24 = 100·67. The structural formulae for this and eleven other amphiboles recently described are calculated and discussed. The problem of the hydroxyl group in amphiboles is discussed in detail and it is suggested that the excess of hydrogen over the theoretical value in many amphiboles may be due to the presence of oxonium (H_3O). S. I. T.

[GLAGOLEV (A. A.) & KLAGUISH (B. D.)] Глаголев (А. А.) и Клагиш (Б. Д.). Некоторые амфиболы и пироксены железистых кварцитов Курской магнитной аномалии. [*Some amphiboles and pyroxenes of jaspilites of the Kursk magnetic anomaly.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 286–297, 6 figs.

The following minerals found in the pre-Cambrian

ferruginous quartzites are described: actinolite, alkali amphibole, and aegirine. In each case the optical data and chemical analyses of different varieties are given.

S. I. T.

Shidô (Fumiko). *Calciferous amphibole rich in sodium from jadeite-bearing albitite of Kotaki, Niigata Prefecture.* Journ. Geol. Soc. Japan, 1958, **64**, 595–600, 1 fig.

Albitite occurs as masses of various size within the serpentinites of the Kotaki district; the core of albitite is enclosed by a shell of jadeite which is in turn enclosed by a shell of calciferous amphibole immediately against the serpentinite. Chemical analysis of the colourless amphibole by H. Haramura gave SiO_2 50·91, Al_2O_3 8·68, TiO_2 0·08, Fe_2O_3 1·61, FeO 3·61, MnO 0·12, MgO 19·38, CaO 10·25, Na_2O 3·40, K_2O 0·11, H_2O+ 1·74, H_2O- 0·17, P_2O_5 0·05, = 100·11; with α 1·622, β 1·632, γ 1·641; $2V_\alpha$ 82°, $\gamma : c$ 18°; dispersion strong $r > v$. This amphibole is compared with széchenyiites from Burmese jadeite rocks. [M.A. **4**–47]

R. A. H.

Truswell (J. F.). *A petrological study of dolerite sills in the Jagersfontein diamond mine, Orange Free State.* Trans. Roy. Soc. S. Africa, 1955, **34**, 409–416, 1 fig.

A multiple sill of Karroo dolerite 820 feet thick traverses the productive kimberlite pipe of Jagersfontein. The two members are roughly equal in thickness and each shows a concentration of pyroxene and olivine at a higher level than is usual in sills where crystal settling is operative. The estimated composition of the augite at 10 different levels ranges from $Mg_{45}Fe_{13}Ca_{42}$ to $Mg_{34}Fe_{36}Ca_{30}$; pigeonite has $2V_\gamma$ 4°–17°; orthopyroxene has γ 1·708–1·714, 2V 67°–64°; the olivine is estimated to fall in the range Fa_{13-36} with a composition of Fa_{51} in a dolerite pegmatite vein near the top of the upper sill.

R. A. H.

[Lebedev (A. P.)] Лебедев (А. П.). О составе породообразующего клинопироксена из траппов р. Чуни (Восточная Сибирь). [*On the composition of rock-forming clinopyroxene from traps of the river Chuni (East Siberia).*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (6), 704–706.

Clinopyroxene (pigeonite-augite) occurs in the Siberian Traps (dolerites and gabbro-diabases) in the proportion 25–30 vol.%. A clinopyroxene from an olivine-dolerite sill was separated and analysed, giving SiO_2 50·57, TiO_2 0·54, Al_2O_3 3·42, Fe_2O_3 0·79, FeO 7·28, MgO 16·17, CaO 20·09, ign. loss 0·88, = 99·74, corresponding to $En_{47}Wo_{40}Fs_{12}$. It is weakly brown in colour, non-zonal; α 1·697, β 1·702, γ 1·710, 2V(+) 48°, $\gamma : c$ 43°. A comparison is made with other analysed pyroxenes from basic igneous rocks.

S. I. T.

Rothstein (A. T. V.). *Pyroxenes from the Dawros peridotite and some comments on their nature.* Geol. Mag., 19[illegible] **95**, 456–462, 2 figs.

The rhythmic layering of the Dawros ultramafic body produced concentrates of orthopyroxene and clinopyroxene which in some cases have been recrystallized by later metamorphism. Chemical analyses and optical data are presented for one primary and one recrystallized diopsidic clinopyroxene, and for two primary and three recrystallized magnesian orthopyroxenes. A highly aluminous orthopyroxene has also been analysed ($Ca_{0·6}Mg_{71·2}Fe_{28·2}$; Al $Z = 9·1\%$). [M.A. **14**–154]

G. M. B.

[Saldau (E. P.)] Сальдау (Э. П.). Зависимость между показателями преломления, размерами элементарной ячейки и составом в изоморфном ряду форстерит-фаялит. [*Dependence between refractive indices, dimensions of elementary cell and composition in the forsterite-fayalite isomorphous series.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 234–239, 2 figs.

Calculations based on existing data lead to the establishment of two formulae: $c = 5·207 + 0·463\beta$ and $c = 5·12$ $0·49\alpha$. This allows additions to the diagram of A. Winchell showing the relation between α, β, γ, and a, b, c parameters of the unit cell for the olivine series.

S. I. T.

Ueda (T.). *On the biaxialization of zircon.* Mem. Coll. Sci. Univ. Kyoto, Ser. B, 1956, **23**, 297–304, 2 figs.

The expansion of the zircon lattice on metamictization is shown to be anisotropic and to give a 2V of 0–10°. Values obtained were:

Locality	sp. gr.	a_1	a_2	c	$a_1 : a_2$	2V
Burma	4·66	6·600	6·595	5·974	1·001	0
Omiya-chô (Kôbe), Kyoto Pref.	4·40	6·620	6·612	6·001	1·001	2
Hagata-mura, Ehime Pref.	4·38	6·616	6·678	6·016	0·9907	0
Mineyama-chô (Oro), Kyoto Pref.	4·24	6·660	6·658	6·032	1·000	0
Omiya-chô (Morimoto), Kyoto Pref.	4·21	6·645	6·776	6·043	0·9807	8
Yamaguchi-mura, Nagano Pref.	4·20	6·717	6·704	6·049	1·002	3
Ishikawa-chô, Fukushima Pref.	4·18	6·657	6·730	6·080	0·9892	8
Otsu-shi (Shimotana-kami), Shiga Pref.	4·18	6·623	6·803	6·078	0·9735	10

R. A. H.

[Vasilieva (Z. V.)] Васильева (З. В.). О роли марганца в апатитах. [*On the role of manganese in apatites.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 19[illegible] **87** (4), 455–468.

The study of 50 apatites from Soviet localities and eight Mn-rich apatites in greater detail, including chemical analysis, curves of light absorption, and X-ray examination leads to the following conclusions: Mn^{2+} and Mn^{3+} a cations replacing Ca; Mn^{7+} enters into the lattice of apati

n acidic ion $[MnO_4]^{1-}$ replacing $[PO_4]^{3-}$; the compensa- of charges occurs through the replacement of F or by O ; the colour of apatite increases in intensity with ease of Mn but the nature of the colour depends on the ree of Mn oxidation, thus Mn^{2+} produces pale pink and e tones, Mn^{3+} blue, and Mn^{7+} violet ; the specific gravity the index of refraction increase with increase of Mn. atites which contain different stages of oxidation of nganese were formed in different geological settings and different mineral associations. S. I. T.

ST (N.) & STURT (B. A.). *Crystallographic and geological factors in the growth of garnets from Central Perthshire.* Nature, 1957, **179**, 215.

The systematic arrangement of inclusions and clear ions found in most of these garnets is explained in terms crystal growth rates, together with a change in the nditions of growth from static to dynamic. C. J. E. K.

IMODA (N.). [*Geochemical investigations on the pegmatite minerals. IV. The relation between stages of crystallization and chemical composition of garnets in the Yamanoo pegmatite of Makabe-Machi, Makabe-Gun, Ibaraki Prefecture.*] Nippon Kagaku Zasshi, 1955, **76**, 1251–1253, 1 fig.

Chemical analyses are given for three almandine-spessar-ne garnets and it is shown that the MnO : FeO ratio creases towards the centre of the pegmatite, with MnO rying from 12·18 to 17·07%. Their Ga content of 10 p.p.m. compared with that of the co-existing micas (260–300 p.m.). [M.A. **14**–285] R. A. H.

TBRAMANIAM (A. P.). *Mineralogy and petrology of Sittampundi complex, Salem District, Madras State, India.* Bull. Geol. Soc. America, 1956, **67**, 317–390, 19 figs., 5 pls., 1 map.

The mineralogy and petrology of a thoroughly metamorphosed and reconstituted layered complex of anorthotic rocks with associated gabbroic and chromitic facies e described in detail. The mineral associations are unique nd new optical and physical properties and chemical halyses are given for grossular and pyrope-almandine arnets ; blue non-pleochroic cordierite (A) from cordierite-orundum-sillimanite-anthophyllite-bytownite rock, $\frac{3}{4}$ mile W. of Karungalpatti, $r<v$ weak ; pale yellow faintly pleochroic clinozoisite (B) from anorthite-clinozoisite rock, orundum quarries $1\frac{1}{2}$ miles S.W. of Sittampundi, with O.A.P.=(001), elongation parallel to b axis, $\alpha : c = 0°–36°$, ispersion variable, weak to strong ; zoned plagioclase with ims An_{80}, core An_{50} ; edenite ; pargasite ; anthophyllite ; hromite ; and snow-white transparent anorthite (C) from northite-clinozoisite-garnet rock, 2 miles S. of Konasamudram, $r<v$ weak, minimum melting temperature 1548°C, composition An_{98}. Additional optical and physical data are given for ortho- and clinopyroxenes, scapolite and corundum, and eight rock analyses are presented. A plot of chemical analyses of various garnetiferous metagabbros and eclogites and their associated garnets suggests a distinct compositional field for most true eclogites as compared with garnetiferous metagabbros. Deformation and mineral reconstitution during two periods of Archean orogeny following primary crystallization from a basic magma modified the paragenesis and mineralogy of these rocks which are interpreted as a metamorphosed gravity stratified sheet.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O
A	49·54	0·03	33·42	0·14	3·75	0·09	11·34	0·10	0·32
B	38·64	0·14	27·69	7·57	0·14	0·04	0·11	23·79	—
C	43·88	0·00	36·18	0·08	0·00	0·00	0·00	19·37	0·22

	K_2O	H_2O^+	H_2O^-	Total	α	β	γ	2V	sp. gr.
A	0·01	1·32	0·03	100·10	1·5392	1·5438	1·5462	−66°	2·591
B	—	1·84	0·00	100·01	1·718±	1·723±	1·726±	±85°	3·390
C	0·00	0·28	0·08	100·10	1·5754	1·5833	1·5885	−77·2°	2·749

(Also : A, F 0·01 ; B, Cl 0·07, O≡Cl 0·02 ; C, SrO 0·01 ; the clinozoisite B has variable optics).

R. A. H.

Petrology : sedimentary

[TATARSKY (V. B.), RUKHIN (L. B.), editors] Татарский (В. Б.), Рухин (Л. Б.), редакторы. Справочное руководство по петрографии осадочных пород. [*A reference manual on the petrography of sedimentary rocks.*] Том I. Условия образования, свойства и минералы осадочных пород. [*The conditions of formation, properties, and minerals of sedimentary rocks.*] 483 pp., 277 figs. Price 24 r. 10 k. Том II. Осадочные породы. [Sedimentary rocks], 519 pp., 176 figs. Price 25 r. 30 k. Гос. Нау.-Тех. Изд. [State Sci.-Techn. Publ.], 1958.

A number of contributors are included in the production of these two volumes, of which only the abbreviated contents can be given here. Vol. I : Ch. I, General information ; Ch. 2, Classifications ; Ch. 3, Distribution and composition ; Ch. 4, Weathering, transport and deposition ; Ch. 5, Consolidation ; Ch. 6, General regularities. Facies and formations ; Ch. 7, Textures ; Ch. 8, Physical properties ; Ch. 9, Geophysical methods of study ; Ch. 10, Minerals ; Ch. 11, Organic components of coals, carbonaceous rocks, and oil shales. Vol. II : Part 1, Main series : Ch. 1, Pyroclastics ; Ch. 2, Coarse fragmental rocks ; Ch. 3, Arenaceous ; Ch. 4, Argillaceous ; Ch. 5, Coals ; Ch. 6, Allites ; Ch. 7, Ferruginous rocks and iron ores ; Ch. 8, Sedimentary manganese deposits ; Ch. 9, Siliceous ; Ch. 10, Phosphatic ; Ch. 11, Calcareous-magnesian carbonate rocks ; Ch. 12, Gypsum and anhydrite ; Ch. 13, Salt rocks : Part 2, Secondary series : Ch. 14, Cupriferous rocks ; Ch. 15, Glauconite rocks ; Ch. 16, Zeolite and zeolitic bearing rocks ; Ch. 17, Sulphurous rocks ; Ch. 18, Bitumens and naphtides ; Ch. 19,

Borate rocks. The second volume is followed by 33 plates and an index. The two volumes contain a large number of illustrations in the text. S. I. T.

[Strakhov (N. M.)] Страхов (Н. М.) О теоретической литологии и ее проблемах. [*Theoretical lithology and its problems.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1957, no. 11, 15–31.

This is a brief discussion of the fundamental processes involved in the formation of sedimentary rocks. Two phases of formation are distinguished : (1) the formation of the rock—lithogenesis, subdivided into two stages—sedimentogenesis and diagenesis ; (2) secondary transformation of the rock—metagenesis, subdivided into epigenesis and protometamorphism. S. I. T.

[Nikolaev (S. V.)] Николаев (С. В.). Основные типы доломитов Самарской Луки и их физические свойства. [*The principal dolomite types of Samarskaya Luka, and their physical properties.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **17**, 143–154, 9 figs.

Porosity, water saturation, and other physical properties of the Upper Carboniferous dolomites of the Kuibyshev district at the big loop of the river Volga, are studied in relation to the petrographical nature of the rocks examined. S. I. T.

Kuenen (Ph. H.). *Experimental abrasion 3. Fluviatile action on sand.* Amer. Journ. Sci., 1959, **257**, 172–190.

Experimental studies showed that mechanical abrasion of sand-size quartz and limestone grains is negligible during river transport, that therefore, elimination of limestone and feldspar during fluviatile transport is not caused by abrasion, and that downstream variation of roundness must result from some other agency such as shape-sorting or chemical attack. H. W.

[Molodtsov (V. A.)] Молодцов (В. А.). Характеристика ирригационных наносов Самаркандского оазиса. [*The characteristics of the irrigation deposits of the Samarkand Oasis.*] Почвоведение [Pedology], 1958, no. 2, 18–25, 8 tables.

The chemistry and mineralogy of the sediment carried in the waters of the River Zeravshan and various parts of the irrigation system linking it with the Samarkand Oasis are described and compared with those of the sediment deposited. Rock fragments, quartz, feldspars, and micas predominate. R. C. M.

White (Donald E.), Brannock (W. W.), & Murata (K. J.). *Silica in hot-spring waters.* Geochim. Cosmochim. Acta, 1956, **10**, 27–59, 8 figs.

Most of the silica in hot spring waters is present as H_4SiO_4 with solubilities of 110 p.p.m. at 25°C, and 300 p.p.m. at 90°C, independent of pH in the range 1 to 7. Many hot-spring waters become supersaturated with respect to dissolved silica when cooled ; the dissolved silica is polymerised to colloidal silica (and later to gelatinous silica) at a rate increasing with the degree of supersaturation if the pH is between 6 and 9. Polymerisation is slow in more acid waters where a degree of supersaturation below 100% may result in a metastable solution. Other factors favouring polymerisation are the presence of colloidal silica originally present at high temperature and the presence of opaline sinter ; algae are thought to be of only minor importance in precipitating silica. Opal is formed from monomeric or smaller polymeric molecules of silica at or near vents of springs that are supersaturated with respect to amorphous silica ; with the opal or opaline sinter, however, gelatinous silica may deposit which, on desiccation, produces powdery silica. Although opal is formed most favourably at low temperatures it can occur up to 140°C. As time, temperature, and depth of burial increase opal is changed to chalcedonic sinter with a little quartz. Neither chalcedony nor quartz is recognised in primary hot-spring sinter or near-surface veins. J. R. B.

Jensen (A. Touborg), Wøhlk (C. J.), Drenck (K.), Andersen (E. Krogh). *A classification of Danish flints, &c. : based on X-ray diffractometry.* Comm. Alkali Reactions in Concrete, Copenhagen, Proc. Rept. D.I., 1957, 37 pp., 15 figs.

Forty-two Danish flints and other siliceous rocks, all except one from Cretaceous sources, have been studied by X-ray diffractometry. The α-quartz content varies from about 100 to 0%. The average particle size of α-quartz was determined by means of the width of the $10\bar{1}1$ reflection to be about 430 ± 50Å. Opal comprises a range of substances varying from a completely glassy variety, through a partly platy, partly cryptocrystalline stage with cristobalite atomic arrangement of increasing order, to a material in which a considerable part of the silica is present as α-quartz. The alkali-reactive properties in concrete are discussed. H. M.

Humphries (D. W.). *Chert : its age and origin in the Hythe Beds of the western Weald.* Proc. Geol. Assoc., 1956, **67**, 296–313.

Field and petrographic examination of cherty glauconitic sandstones shows that the chert originated through the primary precipitation of silica gel on the sea bed. R. St J. L.

YE (JOHN C.) & SWINEFORD (ADA). *Silicified rock in the Ogallala formation.* Bull. Kansas Geol. Survey, 1946, **64**, pt. 2, 33–76, 1 fig., 8 pls.

Silicified zones and lentils in the Pliocene Ogallala rmation occur over a region extending from South kota to west-central Texas. The two major rock types e so-called quartzite (sandstone and conglomerate with al cement) and chert, which consist of opal, chalcedony, lcite, and scattered sand grains. The quartzite is restricted the lower part of the formation, below the horizon of ominent volcanic ash deposits. Its cementing material believed to have been derived by hydration and leaching om volcanic ash during Ogallala time ; the main source the silica in the chert is thought to have been Pleistocene lcanic ash. Deposition of the opaline silica seems to have curred by replacement of calcium carbonate. (Nine em. anals.)

A. Sw.

TEARNS (HAROLD T.) & ISOTOFF (ANDREI). *Stratigraphic sequence in the Eagle Rock volcanic area near American Falls, Idaho.* Bull. Geol. Soc. America, 1956, **67**, 19–34, 5 figs., 5 pls. (1 map).

Two series of siliceous tuffaceous shallow-water sediments re separated by a welded rhyolite tuff (ignimbrite) often oneycombed with lithophysae, and also sometimes containing spherulites. Later Lower Pliocene(?) rocks include he thick basaltic tuffs, breccias, dykes, and lava flows of he Massacre volcanics. A major unconformity separates he Tertiary rocks from the Late Pleistocene Cedar Butte livine basalt flow.

R. A. H.

BIGGS (D. L.). *Petrography and origin of Illinois nodular cherts.* Illinois State Geol. Survey Circ., 1957, **245**, 25 pp.

Seventy-eight samples of nodular chert from 18 Illinois imestone and dolomite formations, ranging from Cambrian hrough Mississippian age, were studied. Regardless of eologic age or type of host rock, the nodules were similar n mode of occurrence and in principal textural characeristics. The cherts are dominantly microcrystalline or ryptocrystalline quartz with a lesser amount of fibrous quartz. Almost all contain residual masses of their host ock. Field relationships and a variety of evidence indicative of replacement lead to the conclusion that the cherts are epigenetic concretions formed by metasomatic processes during diagenesis resulting in aggregation of silica which originally had been deposited syngenetically with, and dispersed through, the host rock. [M.M. **29**–573 ; M.A. **11**–405, **12**-180]

W. A. Wh.

[PAVLOVIĆ (S.) & MAKSIMOVIĆ (B.)] Павловић (С.) и Максимовић (Б.). Геолошко-минералошка испитивања хидрокварцита код села Попине. [*Geological and mineralogical investigations of the hydroquartzites near Popina (Serbia).*] Зборник радова геол. инст. «Лован Жујовић». [Recueil des travaux de l'institut de géologie 'Jovan Žujović'], 1957, **9**, 1-10, 4 figs, 2 maps. (Serbian with French summary).

The hydroquartzites are of hydrothermal origin and form a layer in the sandstones of Tertiary age. Twenty-six chemical analyses of hydroquartzites are given, with content of silica varying around 98%. The quartz rock consists mainly of extremely fine grains of quartz accompanied by chalcedony and lutecite. Z. M.

WILLIAMSON (W. O.). *Silicified sedimentary rocks in Australia.* Amer. Journ. Sci., 1957, **255**, 23–42, 4 figs.

Silicified materials resembling certain South African silcretes in occurrence and petrography are described, and also silicified aeolian sands, and sub-basaltic quartzite exposed by removal of its igneous cover. Seventeen chemical analyses are appended, together with four new analyses of silcrete from Cape Province, South Africa. The difficulties in the nomenclature and diagnosis of quartz, chalcedony, and opal are discussed. [M.M. **29**–573 ; M.A. **5**–381, **11**–405]

R. A. H.

LOWRY (W. D.). *Cementation of Quartzose Sandstones of Western Virginia.* Virginia Journ. Sci., 1958 **9**, 431.

Observations on the origin of the cementing material of quartzose sandstones of different ages. R. S. M.

MICHOT (P.). *Classification et terminologie des roches lapidifiées de la série psammite-pélitique.* Ann. Soc. Géol. Belgique, 1957–58, **81**, B311-342, 9 figs., 6 photos.

A general division into 3 classes is based on the proportion of argillaceous bond. In each class, subdivision is made according to the size of the quartz grains. Further subdivision is based on the nature of the detrital grains other than quartz (feldspar, &c.) A reasoned case is made out for the new classification into quartzites, psammoquartzites, microquartzites, pelitoquartzites, sandstones, psammites, micropsammites, pelitopsammites, micropsammophyllites, pelitophyllites, and pelophyllites. J. M.

LOWENSTAM (H. A.) & EPSTEIN (S.). *On the origin of sedimentary aragonite needles of the Great Bahama Bank.* Journ. Geol. 1957, **65**, 364–375, 5 figs.

Field evidence indicates that sedimentary aragonite needles may be derived from certain algal carbonates. Isotope ratios for both carbon and oxygen of the aragonite

needles are in the range of those of the algal carbonates and outside the range for oolites and grapestones, which would indicate that these aragonites are primarily of organic origin. R. A. H.

Michot (P.). *Les brèches calcaires à ciment de calcite macrosphérolitique*. Ann. Soc. Géol. Belgique, 1954–55, **78**, B353–367, 8 figs.

A study of the Viséan breccias of Belgium. This type of breccia results from internal fracturing of a sedimentary mass under a thin cover of sediments following on slip within the mass. The author calls such breccias 'brèches parasédimentaires'. J. M.

Swineford (Ada), Leonard (A. Byron), & Frye (John C.). *Petrology of the Pliocene pisolitic limestone in the Great Plains*. Bull. Kansas Geol. Survey, 1958, **130**, pt. 2, 97–116, 1 fig., 5 pls.

Study of polished sections and thin sections of oriented samples of pisolitic (formerly known as 'algal') limestone from the Pliocene Ogallala formation indicates that the rock is a caliche which developed predominantly by soil-forming processes acting on calcareous feldspathic sands and silts. J. Ph.

Alderman (A. R.) & Skinner (H. Catherine W.). *Dolomite sedimentation in the south-east of South Australia*. Amer. Journ. Sci., 1957, **255**, 561–567.

Fine grained dolomite-calcite sediments of Pleistocene to Recent age occur over a wide area in South Australia and similar sediments are now being formed in a number of saline lakes and in a shallow inlet of the sea. The origin of the dolomitic sediments is ascribed to elevated pH caused by plant growth in shallow saline water. R. A. H.

Sturgeon (E. S.). *The Gasport Dolomite, Ontario*. M.Sc. Thesis McMaster Univ., 1955, 60 pp. Abstr. in Canad. Mining Journ., 1956, **77**, no. 3, 69.

Petrographic and sedimentological study suggests that the material was deposited on a shelf or bank. A thin layer of jarosite was found. W. R. G.

Bramkamp (R. A.) & Powers (R. W.). *Classification of Arabian carbonate rocks*. Bull. Geol. Soc. America, 1958, **69**, 1305–1318.

The size and sorting exhibited by a carbonate rock are believed to be equally reliable indicators of depositional environment whether the particles formed in place or nearby, or were transported from some distant source. The classification is based on original particle size, degree of alteration in original sedimentary texture, type of alteration, and amount of visual porosity. This classification not only presents the nature of the carbonate sediments at the time of deposition, but also goes sufficiently into the changes they have undergone after deposition to allow adequate description for use in reservoir and other detailed geologic studies. A. L. A.

Shrode (R. S.). *Physical characteristics of the oolite grain of the Ste. Genevieve formation*. Trans. Illinois Acad. Sci., 1949, **42**, 116–119.

The oolite grains of the Ste. Genevieve limestone bed have the size of a well-sorted, medium- to coarse-grained sand and do not appear to have been transported far. The roundness values are all higher than 0·5. There is evidence suggesting that the growth of oolite grains is accompanied by an increase in roundness. The unequal three dimensional character of the oolite grains suggests that detailed shape interpretation from thin sections may be misleading. W. A. Wh.

Hase (Donald H.). *Upper Huronian sedimentation in portion of the Marquette trough, Michigan*. Journ. Geo 1957, **65**, 561–574.

Field and laboratory studies indicate that the Upper Huronian metavolcanic and metasedimentary rocks including the iron formation are geosynclinal. The iron formation interpreted as having formed during periods of quiescence. Graphitic material associated with the rocks underlying and overlying the iron formation suggests the presence of life during the period of iron deposition. Abnormally high percentages of TiO_2 in some metasediments are believed to correlate with periods of igneous activity. H. L.

Bernard (André). *Sur l'origine du minerai de pyrite de Soulier (Gard)*. C.R. Acad. Sci., 1955, **241**, 228–231.

The sedimentological conditions peculiar to an area of shoal in a triassic lagoon justify the hypothesis of a sedimentary diagenetic origin of the deposit of pyrites at Soulier. E. J. & A. S.

Zen (E-an). *Preliminary report on the mineralogy and petrology of some marine bottom samples off the coast of Peru and Chile*. Amer. Min., 1957, **42**, 889–903.

X-ray and optical methods were used in the examination of fourteen marine bottom core samples from the coast of Peru and Chile. The following minerals were definitely identified: quartz, plagioclase, illite, chlorite, kaolinite, montmorillonite (scarce), calcite, aragonite, pyroxene (detrital), amphibole (detrital), and an oxide of iron. Within a given core the distribution and textural relations of the minerals tend to remain constant. Considerable differences exist between the cores. Volcanic glass, often

mpletely or partially devitrified, is found in many mples. Devitrification products include clay minerals l calcite. G. D. N.

RON (GUY) & DEBYSER (JACQUES). *Sur la présence dans des vases organiques de la mer Baltique du sulfure manganeux β hexagonal.* C.R. Acad. Sci., Paris, 1957, **245**, 1148–1150.

Organic mud from the Baltic consisted of quartz, feldspar, te, kaolinite, and a mineral identified by X-rays as the xagonal β variety of MnS : only α-MnS, alabandite, has eviously been recognised in natural occurrences. Indexed -ray powder data are listed. [M.A. **6**–169, **13**–446] R. A. H.

IARLIER (P.). *Sur la présence d'un quartzite houiller remarquable à Dalhem (Nord de Liège) et sa position stratigraphique.* Publ. Assoc. Étude Paleont. Stratigr. Houillères, Brussels, 1955, no. 21, 173–188, 2 figs.

A microscopic description (3 pp.) and a chemical analysis a ganister are given. R. V. T.

EMPLETON (J. S.). *The Mt. Simon sandstone in northern Illinois.* Trans. Illinois Acad. Sci., 1950, **43**, 151–159.

The Mt. Simon sandstone has two facies, one light olored and the other red. The sandstone ranges from very ne to very coarse ; much of it is conglomeratic. Zones the base are arkosic and locally contain biotite and uscovite flakes. Some parts are dark red or variegated, artially micaceous shale and siltstone. The heavy minerals nclude a large percentage of tourmaline and zircon. In ertain members apatite, garnet, and magnetite are common. W. A. Wh.

HRODE (RAYMOND) & LAMAR (J. E.). *Sands and silts of extreme southern Illinois.* Illinois State Geol. Survey Circ., 1953, **184**, 28 pp.

The sands and silts range in age from Cretaceous to Recent. Their mineral composition is dominantly quartz vith muscovite and clay minerals common. Feldspars in mall amounts are found in Cretaceous sands. Cretaceous nd Tertiary sands are non-calcareous. Some of the Pleistoene and Recent valley-fill deposits are limy. Chemical nd particle size data are given. W. A. Wh.

HELMBOLD (REINHARD). *Contribution to the petrography of the Tanner greywacke.* Bull. Geol. Soc. America, 1958, **69**, 301–314, 5 figs. Translated by F. B. Van Houten from Heidelberger Beitr. Min. Petr., 1952, **3**, 253–288.

Rocks of the Harz Mountains that have long been called greywacke are described in detail. Chemical analyses, petrographic descriptions, modal analyses, estimates of the mineral components of rock fragments, and measurements of sorting, shape, and orientation of grains are presented for three typical samples of different grain size. The poor sorting and poor rounding of the grains, the abundant feldspar and rock fragments, and the postulated mode of origin of the Tanner greywacke agree with descriptions of other greywackes, but the Tanner greywacke contains more feldspar and rock fragments and less matrix than published analyses indicate for other greywackes. A. L. A.

WANLESS (H. R.). *Geology and mineral resources of the Beardstown, Glasford, Havana and Vermont quadrangles.* Bull. Illinois State Geol. Survey, 1957, **82**, 233.

A petrographic description is given for each stratigraphic member, including sandstones, limestones, underclays, shales, and coals. The middle and lower Tradewater sandstones contain very little mica and no feldspar and are noncalcareous ; the quartz shows secondary enlargement. The upper Tradewater sandstones contain more mica, some feldspar, and such heavy minerals as zircon, tourmaline, garnets, and pyrite. The sandstones are cemented with calcium carbonate. The Carbondale and McLeansboro sandstones are of the greywacke type. The underclays below the No. 2 coal are kaolinitic whereas those above are illitic. W. A. Wh.

POTTER (P. E.) & GLASS (H. D.). *Petrology and sedimentation of the Pennsylvanian sediments in southern Illinois : A vertical profile.* Illinois State Geol. Survey Rept. Invest., 1958, **204**, 59 pp.

The primary objective of this study was to provide a vertical profile of Pennsylvanian petrology and sedimentation in the Eastern Interior Coal basin by study of gross lithology, sedimentary structures, and mineralogy in both sandstones and shales. The basal Pennsylvanian sandstones are mature orthoquartzites, the younger are subgreywackes which are sparingly feldspathic, noticeably micaceous, and have abundant detrital matrix. The heavy minerals of both sandstone types are dominantly zircon and tourmaline ; garnet and apatite are minor accessories in the sub-greywacke sandstones. The sandstones of both facies are richer in kaolinite than their associated shales ; this contrast is attributed to post depositional diagenesis. Comparison of core samples of shales of the two petrographic facies revealed only small differences. For all shales the relative ranking of clay minerals was mica (illite)>chlorite>kaolinite>mixed lattice. Within this series kaolinite tends to be more abundant below than above coal beds. Contrasts in depositional environments are associated with only minor change in clay mineral composition because of a rapid rate (inferred) of sedimentation. The underclays of coal beds are notable exceptions to this generalization. W. A. Wh.

Hopkins (M. E.). *Geology and petrology of the Anvil Rock Sandstone of southern Illinois.* Illinois Geol. Survey Circ., 1958, **256**, 49 pp., 2 pls., 14 figs.

Study of the sand and clay fractions shows negligible mineralogical differences between the sheet and channel phases. The sandstones of both of the Anvil Rock Sandstone phases are subgreywackes, the channel phase being distinguished by greater thickness, coarser grain, better sorting, and more prevalent cross-bedding. The sheet phase is probably a regressive marine sandstone, whereas the channels are considered subaerial in origin with fluvial sandstones and shales as the main infilling. The light minerals are quartz (igneous, metamorphic, and metamorphic quartzite), untwinned potash feldspar and twinned plagioclase), clay (vermicular books of kaolinite), calcite, chert, rock fragments, muscovite, chlorite, and biotite. The heavy minerals are chalybite, leucoxene, magnetite, ilmenite, pyrite, zircon, tourmaline, chlorite, rutile, garnet, and anatase. The minerals of the shale phase are kaolinite, illite, mixed-lattice clay minerals, and chlorite.

W. A. Wh.

Nixon (Earl K.), Runnels (Russell T.), & Kulstad (Robert O.). *The Cheyenne sandstone of Barber, Comanche, and Kiowa Counties, Kansas, as raw material for glass manufacture.* Bull. Kansas Geol. Survey, 1950, **86**, 41–84, 4 figs., 2 pls.

Metallurgical, chemical, and petrographic data were obtained from samples of Cretaceous Cheyenne sandstone from 12 drill holes in south-central Kansas. Clay in fine fraction of outcrop sample has morphology of kaolinite. In the sand-size fraction minerals other than quartz are black, brown, red, yellow, and gray opaques ; pyrite ; barite ; zircon ; staurolite ; tourmaline ; garnet ; rutile ; sphene ; and epidote. Eleven chem. anal. A. Sw.

Swineford (Ada). *Cemented sandstones of the Dakota and Kiowa formations in Kansas.* Bull. Kansas Geol. Survey, 1947, **70**, 53–104, 3 figs., 7 pls.

Sandstones cemented by calcite, dolomite, silica, iron oxide, barite, celestite, ankerite, and asphaltic material are described from the Cretaceous Kiowa and Dakota formations of central Kansas. Age of cementation and sequence of cements are discussed. Twenty-two chem. anals. J. Ph.

Reed (J. J.). *Petrology of the Lower Mesozoic rocks of the Wellington district.* Bull. New Zealand Geol. Survey, 1957, **57** (n.s.), 60 pp., 36 figs.

Chemical analyses are given for greywackes, argillites, spilites, and jaspers of the Wellington district and elsewhere in New Zealand. Their origin and nomenclature are discussed. Secondary minerals noted include epidote, chlorite, pumpellyite, prehnite, laumontite, sphene, pyri[te], calcite, quartz. Illite and kaolinite are identified in r[ed] and green argillites. D. S. C.

Brothers (R. N.). *The structure and petrography of gre[y]wackes near Auckland, New Zealand.* Trans. Roy. So[c.] New Zealand, 1955, **83**, 465–482, 9 figs.

Strongly deformed greywackes and argillites of Nor[th] Auckland contain reconstituted epidote, clinozoisite, spher[e], chlorite, sericite, stilpnomelane, quartz, albite. Prehnit[e] tabular on (001), elongated parallel to a, $2V_\gamma$ 48–80°, well developed along with quartz and albite in tensi[on] fractures in sandstone members. D. S. C.

Wood (B. L.). *The geology of the Gore Subdivision.* Bu[l.] New Zealand Geol. Survey, 1956, **53** (n.s.), 128 p[p.], 3 maps, 46 figs. Price 20s.

The petrography is described of late Palaeozoic, Triassi[c] and Jurassic geosynclinal sediments, totalling about 50,0[00] feet in thickness and composed largely of greywacke[s], argillites, and vitric and lithic tuffs. They were derive[d] from a constantly-forming volcanic pile. Secondar[y] minerals include laumontite and celadonite. Late Palaeo[-] zoic spilites and keratophyres contain secondary pumpell[y]-ite, prehnite, epidote, and sodic plagioclase. Data are give[n] on a Fuller's earth and other clays and economic deposit[s].

D. S. C.

Magdich (F. S.). *The Viking formation in Saskatchewa[n].* M.Sc. Thesis. Univ. Saskatchewan, 1955, 110 pp[p.], 6 maps, 5 pls. Abstr. in Canad. Mining Journ., 195[6], **77**, 70.

The Viking formation consists of subgreywacke sands[tone], sandy shales, silty shales, and shales. Chert forms pebble[s] near the top. W. R. G.

Kulbicki (G.). *Constitution et genèse des sédiments argileux sidérolithiques et lacustres du Nord de l'Aquitaine.* (Thesis Sci. Toulouse, 1953). Sciences de la Terre, Nancy, 1956 (1957), **4**, 5–101, 21 figs., 4 pls.

The clay minerals of these sediments—kaolinite, dickite, halloysite ; montmorillonite, illite, attapulgite—are studied by the classical methods, polarising microscope, electron microscope, d.t.a., X-ray diffraction. The second part is devoted to the siderolitic rocks and their origin discussed. From this study combined with observations in the field the history of the deposits is ascertained. E. J.

Bourguignon (P.). *Associations minéralogiques des limons et argiles des Hautes Fagnes.* Ann. Soc. géol. Belgique, 1953–1954, **77**, 39–59, 2 figs.

The muds are characterized by the association green[ite]

nblende–epidote, which identifies them with the loess· nid-Belgium. The clay from the alteration of the Revi- n, formed in place, is characterized by zoisite and garnet. addition, the muds and clays contain basaltic hornblende, ene, and augite, derived probably from the volcanic ptions of the Eifel. J. M.

IM (Ralph E.), Bradley (William F.), & White (W. Arthur). *Petrology of the Paleozoic shales of Illinois.* Illinois State Geol. Surv., Rept. Invest., 1957, **203**, 35 pp., 6 figs.

A series of Palaeozoic shales were investigated by X-ray fraction. d.t.a., chemical, optical, and electron-micro- pe methods. Illite is the dominant clay mineral in most the shales, kaolinite and a chloritic mineral are present varying amounts, while montmorillonite is rare : the clay neral content of the shales ranges from <40 to almost 0%. Complete chemical analyses are presented for the y fractions (<2 microns) of 55 shales, and X-ray diffrac- meter and d.t.a. curves for several shales are figured. R. A. H.

ATES (Thomas F.) & Strahl (Erwin O.). *Mineralogy, petrography, and radioactivity of representative samples of Chattanooga Shale.* Bull. Geol. Soc. America, 1957, **68**, 1305–1314, 1 pl.

Quantitative studies by a combination of chemical and ineralogical methods have shown the approximate modal rcentages for a batch sample of Chattanooga shale to be iartz 22, feldspar (mostly orthoclase, with some plagio- ase, microcline, and sanidine) 9, illite and kaolinite 31, ganic matter 22, pyrite and marcasite 11, chlorite 2, n oxides 2, tourmaline+zircon+apatite 1. Uranium rms from 0·001 to 0·012 per cent of the rock, most of it ing randomly distributed throughout the fine-grained atrix, and is believed to have been precipitated from sea ater under reducing conditiins and not to have been distributed since compaction of the sediment. [M.A. 3 -139, 140] R. A. H.

FTEDAHL (Chr.). *On the sulphides of the alum shale in Oslo.* Norsk Geol. Tidsskr., 1955, **35**, 117–120, 1 fig.

The well-known tendency of certain Oslo alum shales to ndergo chemical changes and expand on exposure to the ir is probably due to a content of pyrrhotite, which seems have formed during the Caledonian folding of the shale. I. W. O.

OURGUIGNON (P.). *Minéraux volcaniques de l'Eifel dans les limons gaumais.* Ann. Soc. géol. Belgique, 1954–1955, **78**, 173–177, 1 fig.

The author reports the presence of sphene, basaltic hornblende, augite, and enstatite in the surface deposits of the Gaume. These minerals have the same characters and the same relative proportion as in eastern Hesbaye and the Ardennes. Thus they prove to be dispersed in Belgium at a distance of about 175 km from their source. J. M.

Graf (D. L.). *Petrology of the basal high-purity bed of the Burlington limestone.* Trans. Illinois Acad. Sci., 1950, **43**, 160–164.

Fossil debris was deposited with a calcareous mud containing glauconite granules. Compaction followed causing some lineation. Secondary calcite was then deposited in optical continuity on crinoid fragments. At the same time small dolomite rhombs were forming in the matrix. During a fourth stage there was partial replacement of dolomite by calcite. W. A. Wh.

Lamar (J. E.). *Chemical analyses of Illinois limestones and dolomites.* Illinois State Geol. Surv., Rept. Invest., 1957, **200**, 33 pp.

A compilation of more than 700 chemical analyses of Illinois limestones and dolomites, from both published data and unpublished results. Many analyses have been recalculated to enable them to be quoted both in terms of oxides and in carbonate molecules. R. A. H.

Runnels (Russell T.) & Dubins (Ira M.). *Chemical and petrographic studies of the Fort Hays chalk in Kansas.* Bull. Kansas Geol. Survey, 1949, **82**, pt. 1, 1–36, 6 figs., 1 pl.

The average calcium carbonate content of 84 samples of chalk from the Fort Hays member of the Cretaceous Niobrara formation of north-central and central-western Kansas is 94·2%, ranging from 98·1 to 85·8%. Grain size and composition do not vary significantly over the area studied. Constituents other than calcite are quartz, microcline, plagioclase, chalcedony, ilmenite, leucoxene, magnetite, tourmaline, zircon, muscovite, biotite, collophane, limonite, and pyrite. (84 chem. anal., 14 spectrogr. anal.). A. S.

Runnels (Russell T.). *Some high-calcium limestones in Kansas.* Bull. Kansas Geol. Survey, 1951, **90**, pt. 5, 77–104, 3 figs., 2 pls.

Eighteen chem. anal. of Pennsylvanian and Permian limestones of eastern Kansas. A. Sw.

Runnels (Russell T.) & Schleicher (John A.). *Chemical composition of eastern Kansas limestones.* Bull. Kansas Geol. Survey, 1956, **119**, pt. 3, 81–103, 1 fig.

Chemical analyses show the major constituents of 325 samples of Pennsylvanian limestone, and spectrographic

analyses the minor constituents of 288 of the samples. $CaCO_3$ content increases southwestward along the strike, and also southeastward, from younger to older beds.

A. Sw.

Sherwood (W. C.). *A petrographic analysis of the Mosheim formation at Strasburg, Virginia.* Virginia Journ. Sci., 1958, **9**, 426–427.

Petrographic description of the limestone ($CaCO_3$, 98·25% ; $MgCO_3$, 0·80%) in the Dominion Quarry, 2 miles N.E. of Strasburg, Shenandoah County. Insoluble residues average 1·96% and contain quartz, pyrite, muscovite, and illite. R. S. M.

Swineford (Ada). *Petrography of upper Permian rocks in south-central Kansas.* Bull. Kansas Geol. Survey, 1955, **111**, 1–179, 13 figs., 24 pls.

The deposits are predominantly feldspathic sandstone and siltstone, silty shale, and evaporites. The feldspars are chiefly orthoclase, with minor sodic plagioclase and microcline. The most common clay minerals are illite and chlorite, with montmorillonite in the upper part of the section. The red color of the beds is due to hematite stain. Major constituents and heavy minerals of the sandstones are listed and described. (Nineteen chem. anal., X-ray powder data for 4 samples.) J. Ph.

Akaad (M. Kamal). *Petrography, structure and time relations of the Igla formation, Eastern Desert.* Egypt. Journ. Geol., 1957, **1**, no. 2, 93–102, 1 fig., 3 pls. Summary in Arabic, ibid., p. 103.

The Igal formation constitutes a distinct formation of red beds in the late pre-Cambrian of Egypt. Petrographic descriptions of the rock types are given as well as their conditions of sedimentation. E. M. El S.

Greensmith (J. T.). *The status and nomenclature of stratified evaporites.* Amer. Journ. Sci., 1957, **255**, 593–595 ; 1958, **256**, 219.

Stewart (F. H.). *Discussion on the nomenclature of evaporite textures.* ibid., 1958, **256**, 219.

Leake (Bernard E.). *Discussion on the nomenclature of evaporite textures.* ibid., 1958, **256**, 525.

Two new sets of terms for textures of evaporite deposits are suggested, using 'crystic', 'lensic', or 'porphyrocrystic' prefixed by 'evapo' to denote primary textures of deposition, and by 'neo' to denote secondary textures due to recrystallization. Stewart defends the older (and current) usage of terms borrowed from metamorphic petrology. Greensmith's rejoinder points out the undesirability of using such terms because they connote metamorphism. Leake notes that Greensmith's terms also connote origin or history, and advocates reading Niggli's Rocks an Mineral Deposits [M.A. **12**–348] and adopting the term mostly from metamorphic petrology, there redefined purely descriptive terms, in describing all kinds of rocks. H. W.

Wood (G. V.). *The heavy mineral suites of the Lower Gree sand of the Western Weald.* Proc. Geol. Assoc., 195 **67**, 124–137, 5 figs.

Twenty-six minerals are recorded from the four divisio of the Lower Greensand. Most of these were derived fro the London Platform but abundance of kyanite in residu from the Folkestone Sands indicates derivation fro Armorica. S. R. T.

Shukri (N. M.). *Mineral analysis tables of some N sediments.* Bull. Inst. Fouad I Desert, 1951, **1**, no. 39–67, 5 pls.

Tables giving heavy mineral assemblages of 150 sampl of the present Nile sediments and 30 samples from th older terraces of the river. E. M. El S.

Shukri (N. M.) & Azer (N.). *The mineralogy of Pliocen and more recent sediments in the Faiyum.* Bull. Ins Fouad I Desert, 1952, **2**, no. 1, 10–53, 10 pls.

The paper includes tables and descriptions of heav mineral assemblages in some 120 samples from Pliocen Plio-Pleistocene, Palaeolithic, and Post-Palaeolithic sed ments of the Faiyum area, Egypt. E. M. El S.

Shukri (N. M.). *The mineralogy of Egyptian sediment* Bull. Inst. Desert Egypte, 1953, **3**, no. 1, 93–100.

The author discusses the influence of source rocks, en vironment of deposition, mode of origin, the geological ag and diagenesis on the heavy mineral assemblages of Egyp tian sediments. E. M. El S.

Shukri (N. M.) & El Ayouti (M. K.). *The mineralogy o the Nubian Sandstone in Aswan.* Bull. Inst. Dese Egypte, 1953, **3**, no. 2, 65–88, 6 figs.

The paper embodies the results of heavy mineral invest gations of 94 samples from the Nubian Sandstone at Aswa Vertical zoning is indicated. E. M. El S.

Hoehne (Karl). *Zirkonkristalle in Kohlenflözen.* Chemi der Erde, 1957, **19**, 38–50.

A review of many occurrences of zircon crystals in th coal-bearing strata of different ages in several countries Zircons occur in the country rock, in the coal, in the bitu minous shales, and in the clay-stone and similar beds There are two chief types : (1) Malacon, unzoned wit comparatively high radioactivity producing a contac

reole of greater carbonization in the coal ; (2) Zonarzircon, h distinct zoning and mostly low radioactivity. The) types can be distinguished in polished sections. The per also contains information about other minerals in uls. G. Sch.

LLENDER (DEAN L.) & FOLK (ROBERT L.). *Idiomorphic zircon, key to volcanism in the Lower Tertiary sands of central Texas.* Amer. Journ. Sci., 1958, **256**, 257–269.

That a high proportion of idiomorphic zircon grains in ese sediments indicates volcanic activity during deposition shown by the use of triangular diagrams on which are otted (1) percentage of idiomorphic plus hypidiomorphic,) angular to subangular-xenomorphic, and (3) round to bround xenomorphic zircon grains. H. W.

MIES (A. C.). *Petrological features of the rocks of the Maruwenua district, North Otago.* Trans. Roy. Soc. New Zealand, 1952, **79**, 376–385, 1 fig.

Notes on semi-schists containing pumpellyite and stilpomelane ; on heavy-mineral concentrates from the hists and from Upper Cretaceous and Tertiary sediments, cluding zircons of various habits ; and on dolerite sills ith an illustration relating to the development of ophitic xture. D. S. C.

ANGOLD (CARL, *Jr.*), MARSHALL (LEE), & YOUNG (W. K.). *Heavy mineral studies of sediments from Little River Floyd County, Virginia.* Virgina Journ. Sci., 1957, **8**, 331–332.

R. S. M.

AVIS (JAMES H., *Jr.*), CREEL (RANDALL, *Jr.*), & LURATE (ROBERT). *Study of heavy minerals of sands of tributaries to South River, Rockbridge County, Virginia.* Virginia Journ. Sci., 1957, **8**, 328–329.

R. S. M.

HUAIB (S. M.). *A study of minerals in a sediment core from the Gulf of Naples.* Clay Min. Bull., 1954, **2**, 170–176.

Optical examination of the $>0{\cdot}01$ mm fraction of samples rom one of a series of cores in volcanic ash deposits in the ulf of Naples shows predominantly the presence of volcanic lass together with 'aggregates', calcite, fossils, and, in small mounts, sanidine, micas, pyroxene, quartz, and plagioclase. he amounts vary in different horizons, which represent ifferent periods of volcanic activity. One horizon was xamined intensively, using specific gravity separation. he clay fractions examined contain predominantly illite ith some kaolinite and montmorillonite. R. C. M.

WORKMAN (L. E.). *The Neda formation in north-eastern Illinois.* Trans. Illinois Acad. Sci., 1950, **43**, 176–182.

The Neda formation is equivalent to the Clinton iron ore deposit, is present only where the Maquoketa shale is thickest, and probably represents an old soil profile which has been reworked by a pre-Edgewood sea. Some of the iron oolites have been weathered and replaced in part or wholly by calcite. The replacement probably was during Edgewood time or later. W. A. Wh.

MCKIE (D.). *A radio-active phosphorite at Chamoto, North of Iguruzi, Mbeya District.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 85–86.

An apatite rock, in which radioactivity is due to uranium associated with the apatite, contains $0{\cdot}1\%$ U_3O_8 and is regarded as a hot spring deposit. Na_2O, K_2O, and eU_3O_8 are recorded for the phosphorite, 4 agglomerates, and 4 tuffs from Chamoto. J. Ph.

RUNNELS (RUSSELL T.). *Preliminary report on phosphate-bearing shales in eastern Kansas.* Bull. Kansas Geol. Survey, 1949, **82**, pt. 2, 37–48, 2 pls.

For ten phosphate-bearing bituminous shales of Pennsylvanian age chemical analyses are reported, including qualitative spectrographic analyses, percentage of P_2O_5 soluble in citric acid, and trace elements soluble in water. The phosphate and trace elements are present in quantities sufficient for the shales to merit evaluation as a source of agricultural fertilizer. A. Sw.

HAMBLETON (WILLIAM W.). *Petrographic study of south-eastern Kansas coals.* Bull. Kansas Geol. Survey, 1953, **102**, 1–76, 5 figs., 12 pls.

The Mineral, Croweburg, and Bevier coals were analyzed by petrographic evaluation of anthraxylon, attritus, and fusain from 400 thin sections and 22 column samples. Results summarized in bar diagrams show the coals relatively uniform in composition and characterized by a high content of finely banded translucent attrital material. Occurrence and distribution of mineral matter are described. The petrographic composition is related to several chemical and physical properties which affect coal utilization. Essential mineral constituents are calcite and pyrite ; minor constituents are aragonite, marcasite, sphalerite, quartz, apatite, and clay minerals. (Twenty-six chem. anal.). A. Sw.

SIEVER (RAYMOND). *Variation in coal reflectance.* Illinois State Geol. Surv., 1957, Circ. 241, 11 pp., 6 figs.

Minor variations in the reflectance of coal such as that within and between vitrain bands and between vitrinites,

fusinites, and semi-fusinites in the same coal were determined by photomultiplier photometer. Variation of vitrinites with rank seems to be essentially continuous and the results are consistent with those of Broadbent & Shaw [Fuel, 1955] but differ from those of Seyler. There is a more or less continuous variation in reflectance from vitrinites to fusinites and any petrographic identifications based on reflectivity will have to be made using somewhat arbitrary divisions. R. A. H.

Frye (J. C.), Plummer (N.), Runnels (R. T.), & Hladik (W. B.). *Ceramic utilization of northern Kansas Pleistocene loesses and fossil soils.* Bull. Kansas Geol. Survey, 1949, **82**, pt. 3, 49–124, 10 figs., 3 pls.

Fifty-two chemical, 45 spectrographic analyses.

A. Sw.

Plummer (Norman) & Hladik (William B.). *The manufacture of lightweight concrete aggregate from Kansas clays and shales.* Bull. Kansas Geol. Survey, 1951, **91**, 1–100, 4 figs., 7 pls.

Shales of Pennsylvanian, Permian, and Cretaceous age, and clays of Cretaceous, Tertiary, and Pleistocene age were tested for use as lightweight concrete aggregate. Fifty chem. anal., and a general summary of the mineral composition of the various formations sampled are given.

A. Sw.

Petrology: metamorphic—thermal

Jaeger (J. C.). *The temperature in the neighbourhood of a cooling intrusive sheet.* Amer. Journ. Sci., 1957, **255**, 306–318, 4 figs.

The cooling by conduction of an intrusive sheet in the neighbourhood of a contact is discussed, taking into account the effect of heat of solidification. In particular, the case is considered in which the magma and the country rock have the same density and thermal conductivity and the magma is intruded at its liquidus temperature. The values for the temperature thus deduced are more than 100°C higher than those previously calculated. Other thermal variants are discussed and applications of this type of calculation to studies of metamorphism and rock magnetism are outlined. [M.M. **28**–557 ; M.A. **10**–425, **14**–220] R. A. H.

Adie (R. J.). *The petrology of Graham Land. III. Metamorphic rocks of the Trinity Peninsula Series.* Falkland Islands Dep. Survey, 1957, Sci. Rept. no. 20, 26 pp., 4 figs., 2 pls.

The more siliceous sediments of the Trinity Peninsula Series have undergone only recrystallization on thermal metamorphism by intrusive diorites, but the shales originally rich in sericite and chlorite have been transformed int hornfels with biotite, biotite and cordierite, chiastolite an cordierite, or sillimanite, garnet, and biotite. The mo calcareous greywackes have developed pyroxene togeth with recrystallized plagioclase, while in the non-calcareo alumina-rich greywackes biotite and idioblastic pleochro andalusite (α pale pink, β colourless, γ colourless to pa green) are developed, with rare idioblastic almandine garn (*n* 1·815). Chemical analyses are given for quartzite, ca careous greywacke, arkose, and chiastolite-cordierit hornfels. [M.A. **13**–473] R. A. H.

Wells (A. J.). *Corundum from Ceylon.* Geol. Mag., 195 **93**, 25–31.

Corundum-sillimanite-ilmenite-rutile rock occurs as a le in a pyroxene-garnet granulite with gradation via a coru dum-cordierite-almandine-spinel assemblage. The Al_2O rich body may have been a bauxite layer prior to meta morphism. A second occurrence is at the junction of syenite with a siliceous dolomite. Corundum (sapphire plagioclase-sillimanite rock forms a 3 ft zone betwee syenite and the phlogopite seam marking the edge of th dolomite. It probably formed under localised metasomati conditions leading to desilication of the syenite.

R. St J. L.

Neuerburg (George J.). *Origin of porphyroblasts.* Bull Geol. Soc. America, 1957, **68**, 653–654.

The Santa Monica slate of California has been intrude and metamorphosed by a thick sill-like body of biotite hornblende-quartz diorite and in a thick band 500 yar and more from the contact abundant porphyroblasts d andalusite, chloritoid, and cordierite occur. It is suggeste that owing to the slow change of temperature durin metamorphism a few nuclei of these minerals sufficed t gather the necessary components into a relatively few larg crystals, analogous, from a physical-chemical viewpoin to the formation of phenocrysts from a cooling magma.

R. A. H.

Agrell (S. O.) & Langley (J. M.). *The dolerite plug a Tievebulliagh, near Cushendall, Co. Antrim. Part (1) The thermal metamorphism.* Proc. Roy. Irish Acad 1958, **59**, **B**, 93–127, 6 figs., 1 pl.

A plug of olivine dolerite, with a basal layer of picro dolerite, cuts the Lower Basalts at the edge of the Antrim plateau. Within the dolerite there is a large block of meta morphosed lithomarge (porcellanite) which is thought t have sunk in the conduit from the Main Interbasalti Horizon. The basalts and associated boles have bee thermally metamorphosed with the development of hyper sthene, pseudobrookite, cordierite, haematite, tridymite

obalite, and mullite, together with magnetite and ioclase : these mineral assemblages are typical of the amorphic products of the pre-kaolinization stage of thering in which a montmorillonite-group mineral is duced. The products of the metamorphism of the porite inclusion include one group with iron-corundum, n-mullite, haematite, cristobalite, tridymite, magnetite, pseudobrookite, and a second group with a low Fe_2O_3/O ratio with corundum, hercynite, mullite, and corrite, together with cristobalite, tridymite, ilmenite, and gnetite : these two groups correspond to ferruginous uxites and lithomarges in which halloysite, gibbsite, and matite were the principal original constituents. The n-corundum (A) from the porcellanite, analysed by J. M. ngley, has ε 1·785, ω 1·794. Further analyses, by M. slop, are of iron-mullite (B) from the porcellanite (recalated to 100% after deducting 0·85% adsorbed water), 1·690 ; mullite (C) from mullite-cordierite hornfels, rrickmore dyke, Ballycastle, Co. Antrim (recalculated to 0% after deducting 0·42% adsorbed water : <0·5% tile present in the sample), γ 1·671 ; mullite (D) from llite-buchite xenolith, Rudha Chromain, Carsaig, Mull ith trace of rutile), γ 1·666. Analyses are also given for o samples of the hornfels and three of the porcellanite. her occurrences of mullite and the distinction of mullite m sillimanite are discussed.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	Total	Colour
A	0·94	0·37	89·40	9·17	99·88	yellow
B	29·17	0·55	64·55	5·93	'100.00'	pale yellow
C	31·93	2·27	64·86	0·94	100·00	lilac
D	29·93	1·29	68·16	0·62	100·00	lilac

[M.A. **2**–303, **13**–202] R. A. H.

ITCHER (W. S.) & SINHA (R. C.). *The petrochemistry of the Ardara aureole.* Quart. Journ. Geol. Soc. London, 1957, **113**, 393–408, 3 figs.

A single horizon of pelitic schists, half a mile wide and ing both within and without the contact aureole of a anodiorite pluton (5 miles diam.), has been carefully mpled in eight cross-traverses. Over fifty partial analyses ave been made by rapid chemical methods for the major lements, and certain trace elements determined by semiuantitative methods. The contact metamorphism is rgely isochemical, except that H_2O decreases throughout he aureole and Na and K increase slightly towards the luton contacts. Some changes in mineral compositions are onsidered. Four analyses of biotite, from two traverses, how significant increases in $Fe^{2+} : Mg^{2+}$ and in Ti, and lecreases in K, with increasing metamorphic grade.

G. M. B.

BRINDLEY (J. C.). *The garnetiferous beds of the Leinster granite aureole and their small-scale structures.* Sci. Proc. Roy. Dublin Soc., 1954, **26**, no. 14, 245–263, 6 figs., 1 pl.

Manganiferous sedimentary ironstones interbedded with other psammitic and pelitic beds of Lower Palaeozoic age indicate by small scale structures the high degree of plasticity experienced within the aureole. A paragenesis of spessartine-almandine garnet, quartz, and some iron and manganese oxides is described for the ore beds, two chemical analyses of the rock being given. [M.A. **14**–151] J. P.

BRINDLEY (J. C.). *The aureole rocks of the Leinster Granite in South Dublin, Ireland.* Proc. Roy. Irish Acad., 1957, **59**, **B**, no. 1, 1–18, 4 figs.

Normal hornfels and aureole schist are described as products of contact metamorphism in the Lower Palaeozoic slates. Dark biotite hornfelses characterize the immediate margin, andalusite is a common constituent whilst garnet and staurolite are recorded. The schists (muscovite, garnet, staurolite) are contemporaneous with the hornfelses, transitions between the two occur, and are ascribed to the intrusive flow phase of the pluton : wet conditions and a piezocrystallization are suggested for their development. Pneumatolysis and greisening are associated with pegmatite-aplite dykes ; muscovite and tourmaline are introduced, and sillimanite develops in locally deformed hornfels. [M.A. **14**–151] J. P.

[BOBRIEVICH (A. P.)] Бобриевич (А. П.). К метаморфизму ксенолитов в кимберлитах Восточной Сибири. [*On the metamorphism of xenoliths in kimberlites of East Siberia.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 199–201, 4 figs.

Contact phenomena between xenoliths and kimberlites are described. Ultrabasic xenoliths are not affected at all, while xenoliths of acid rocks and limestones are contact-altered. This alteration is due to the liquid magma. Xenoliths of sedimentary rocks found in kimberlite breccia are not metamorphosed. S. I. T.

[PETROV (V. P.) & FINKO (V. I.)] Петров (В. П.) и Финько (В. И.). Тридимит из ксенолита осадочной породы в базальтах горы Богучан. [*Tridymite from a xenolith of a sedimentary rock in the basalt of Mount Boguchan.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.]. 1957, **10**, 21–28, 4 figs.

A highly metamorphosed xenolith of an argillaceous rock contained in a basalt plug or laccolith at Boguchan, Amur district, Siberia, is described. It is composed of albite, tridymite, chlorite, mullite and small amounts of pyrite and rutile. A chemical and a modal analysis of the xenolith rock are given. S. I. T.

[Petrov (V. P.) & Finko (V. I.)] Петров (В. П.) и Финько (В. И.). Муллит и кордиерит в ксенолитах песчаника в базальтах Зейско-Буреинской депрессии. [*Mullite and cordierite in sandstone xenoliths in basalts of the Zeisko-Bureinskaya depression.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **17**, 11–22, 5 figs.

Sandstone xenoliths in basalt at Arkjara Station, Amur railway, are described. Along contacts the sandstone is transformed into buchite containing cristobalite, tridymite, mullite, and cordierite. Chemical analyses and X-ray data are given for the xenolith. S. I. T.

Kennedy (W. Q.). *The formation of a diffusion reaction skarn by pure thermal metamorphism.* Min. Mag., 1959, **32**, 26–31, 2 pls.

Immediately to the south of Inverkip village, Renfrewshire, Scotland, veins and nodules of a concretionary limestone or cornstone, enclosed in sandstone, have reacted to the thermal influence of a later dolerite dyke by the development of a wollastonite reaction skarn. This has been formed by the pseudomorphous replacement of the quartz grains of the enclosing sandstone by wollastonite, due to outward diffusion of calcium from the veins and nodules of cornstone. The process is believed to have taken place under the accelerating influence of the quartz inversion at around 573°C. R. A. H.

[Smolin (P. P.)] Смолин (П. П.). Бруситовый мрамор Сатки. [*Brucite marble of Satka.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохмиии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, **17**, 34–45, 5 figs.

A well-known magnesite deposit occurs in Satka, in the Cheliabinsk region of the Urals. In the present papar a description is given of brucite marble forming the contact zone of Proterozoic dolomite with a diabase dyke. A detailed account is given of the rocks, with chemical and thermal analyses of brucite marble, followed by genetic considerations. The author suggests two new terms: protobrucite marble, for a rock in which dolomite is replaced by an aggregate of brucite and calcite, and apopericlase brucite marble, for a rock containing relics of periclase. S. I. T.

Cooper (John R.). *Metamorphism and volume losses in carbonate rocks near Johnson Camp, Cochise County, Arizona.* Bull. Geol. Soc. America, 1957, **68**, 577–610, 3 pls.

Contact-metamorphosed carbonate rocks near a stock of quartz-monzonite show successive zones characterized by chlorite (locally talc), tremolite, forsterite and diopsid and garnet (with local wollastonite and idocrase) as t stock is approached. The mineralogical and textur changes indicate that the silicate minerals originated by fixed sequence of chemical reactions between original co stituents of the sedimentary rock, with a negligible amou of material added from an outside source but with co siderable interchange of material between beds. Chemic and semiquantitative spectrographic analyses are given f a dolomitic shale, an impure limestone, and a siliceo dolomite and their metamorphosed equivalents. T chemical reactions that can be inferred release CO_2 a result in the formation of denser minerals, suggesting decrease in volume, which is confirmed by stratigraphic measurements showing that the silicated facies is as muc as 30% thinner than the unsilicated facies ; gains and loss of constituents on metamorphism are calculated. Met somatism, which included the formation of Cu and Z replacement deposits, started near the maximum temper ture and increased as the temperature fell. R. A. H.

Antun (P.). *Les porphyroblastes de calcite du Dévoni métamorphique de l'Ardenne.* Ann. Soc. géol. Belgiqu 1953–1954, **77**, B73–81, 2 photos.

The calcite of certain phyllites and quartzites in th Bastogne–Libramont region has recrystallized in the for of tablets parallel to (0001). These crystals enclose detrit elements which have not been recrystallized ; they are c synkinematic origin. J. M.

Petrology: metamorphic—hydrothermal and skarn

De Keyser (W. L.) & Degueldre (L.). *Note concernan l'étude du viellissement accéleré d'un granit Katangais* Bull. Acad. roy. Sci. Colon., Bruxelles, 1955, no. 389–399, 2 figs.

In attempts at artificial ageing by various methods attack by boiling water, treatment in an autoclave at 200° for 36 hours—no mineralogical change was observed Further attempts showed that hydrobiotite is the onl constituent susceptible of profound alteration. J. M.

Ljunggren (P.). *A kaolinized fault zone in gneiss at Letafors northern Vermland.* Geol. Fören. Förh. Stockholm 1955, **77**, 265–274, 4 figs.

During boring and blasting at a depth of about 10 metres for an underground power plant east of Letafors i northern Vermland an argillized zone, ten metres wide, wa discovered. The argillized rock, studied microscopically by d.t.a. and X-ray powder analysis, consists of dominan kaolinite and quartz together with partly chloritized biotit but still holds small remnants of microcline. E. Å-n.

Sonorino (Felix G.). *Hydrothermal alteration in the Front Range mineral belt, Colorado.* Bull. Geol. Soc. America, 1959, **70**, 53–90, 16 figs., 2 pls.

The alteration, which is associated with ore veins, in the Front Range mineral belt was studied by optical, chemical, X-ray, and d.t.a. methods. Six patterns of alteration are described : they range from the simplest type, a single zone of hydromica, to a complex type characterized by phlogopite and siderite (fringe), montmorillonite, kaolinite, orthoclase, and hydromica (innermost) zones. The phlogopite-siderite zone represents the alteration of biotite ; the other zones are based on the alteration of plagioclase. Microcline and quartz are stable in all zones. Chemical analyses of hydromica, and a mixed-layer 1 : 1 illite-montmorillonite are given, with X-ray, optical, and d.t.a. data for a number of clay minerals of the alteration zones. The mineralogy and textural relations of the various alteration zones and patterns of zones are described. Chemical analyses, but no modal data, are given for vein rock, unaltered rock, and three intervening zones from the Chance mine. Compositional changes are discussed and shown on diagrams based on the assumption of no volume change between zones. The origin of the zones is explained in terms of chemical fronts, which developed as the altering fluids migrated away from the conduit. The critical changes, which were responsible for the fronts, are believed to be the Si/Al ratio, K concentration, and pH. The mechanism by which the material was transported, the source and nature of the altering fluids, and the relation of the alteration to the intrusive bodies, are discussed. A. L. A.

Barber (Fred). *Precambrian and Tertiary Geology of Las Tablas Quadrangle, New Mexico.* Bull. New Mexico State Bur. Mines and Mineral Resources, 1958, **45**, 1–101, 13 pls., 3 figs.

Detailed geologic investigation of the Precambrian metamorphic rocks (9 chem. anal.) and Tertiary volcanic rocks (2 chem. anal) of northern New Mexico. The area includes the La Jarita pegmatite district of commercial importance. The granitic pegmatites are surrounded by aureoles of hydrothermal alteration that postdates the regional metamorphism. In the aureoles quartzose and feldspathic rocks have been muscovitized and amphibolite has been partly converted to chlorite and quartz, the net material changes being addition of K, Al, and H_2O and loss of Ca, Mg, Si and a little Na. Fluids from pegmatitic magmas undergoing second boiling are postulated as the cause of the metasomatism. D. H. R.

Avias (Jacques). *Des phénomènes de chloritisation, de serpentinisation et de feldspathisation en Nouvelle Calédonie.* C.R. Soc. Géol. France, 1956, **6**, 307–309.

The rocks (80% of them volcano-sediments) surrounding the masses of peridotite (at their centre) and serpentine (at their margins) are often chloritized through a distance of some millimetres to several decimetres. Further out the peripheral serpentine contains enclaves among which those of the country rock show gradual passage to the serpentine. Study shows that one of the stages of transformation is chloritization, that this chlorite is then replaced by other chlorites which are themselves transformed into antigorite. This would be a *primary* serpentine. Emplacement of granites is for the most part contemporaneous with or later than the peridotites. At their contact is found a thin zone of talc or (Grand Kouru) an aureole of serpentine containing enclaves of granite and scales of talc. Feldspathization affects the surrounding rocks also. E. J.

Exley (C. S.). *Magmatic differentiation and alteration in the St. Austell Granite.* Quart. Journ. Geol. Soc. London, 1959 (for 1958), **114**, 197–230, 9 figs.

A detailed mineralogical and chemical study of the various granite-types in the St. Austell granite mass, Cornwall, and of the china stone and china clay rocks produced by late-magmatic and post-magmatic processes. The four granite varieties range from a biotite-muscovite-granite (plagioclase An_{28}) through a lithionite-granite (An_7) to a fluorite-granite (An_4). Late-magmatic alteration (chiefly along joints) is discussed with reference to tourmalinization and greisening, while post-magmatic alteration is chiefly a process of kaolinization. Chemical analyses of rocks collected in traverses from unaltered to altered granite illustrate the chemical changes in both stages of alteration. In view of the alteration of potassium feldspar to mica in the earlier alteration stage, kaolinization chiefly affects the sodium feldspar. The chemical and physical properties of the agents responsible for alteration of the granites are considered. G. M. B.

Firman (R. J.). *Fissure metasomatism in volcanic rocks adjacent to the Shap Granite, Westmorland.* Quart. Journ. Geol. Soc. London, 1957, **113**, 205–222, 4 figs., 2 pls.

Pre-granite fissures in the Ordovician Borrowdale Volcanic series have undergone chemical and mineralogical changes attributed largely to the action of metasomatizing fluids from the intrusive Devonian Shap Granite. The chemical changes are discussed with reference to analyses of three rocks ; an average hornfelsed andesite, a silicified and albitized reaction zone in hornfels, and a sericitized cordierite-hornfels adjacent to a pyrite vein. The mineral changes refer chiefly to the development of Ca-Fe garnets within the fissures and of epidote in the adjacent wall-rocks, and to the later formation of iron oxides and sulphides filling cracks in the garnet-bearing veins. Chemical analysis of a grossular-andradite garnet is given, together

with optical properties of some garnets, epidotes, and hornblendes. The assemblage of low-temperature hydrothermal minerals in veins, joints, and shatter-belts is listed, and includes salmon-pink laumontite covering slickensided chlorite. G. M. B.

Vitaliano (Charles J.). *Wall-rock alteration in the Broken Hills Range, Nevada.* Journ. Geol., 1957, **65**, 167–177, 7 figs.

Hydrothermal alteration of rhyolite porphyry wall-rock along a vertical fissure has produced a zoned deposit of sericite, talc, and chlorite. Chemical analyses show a progressive enrichment in MgO and a corresponding impoverishment in SiO_2, Al_2O_3, K_2O, and Na_2O across the alteration zone from the host rhyolite porphyry towards the fissure. The feldspars and ferromagnesian minerals of the host rhyolite were replaced first and quartz last : the alteration is attributed to ascending MgO-bearing hydrothermal solutions. Na^+, Ca^{2+} and Fe^{2+} were first removed from feldspars and ferromagnesian minerals and sericite was formed : later K^+ was removed from sericite and with the introduction of Mg^{2+} a talc-pyrophyllite mixture was formed : with continuing introduction of Mg^{2+} considerable amounts of talc and pyrophyllite were replaced by chlorite. [M.A. **10**–234, 363] R. A. H.

Byström (Ann Marie). *Harmotome penetration of a scapolite partly altered to argillic material in Ultevis, North Sweden.* Geol. Fören. Förh. Stockholm, 1956, **78**, 645–653, 5 figs.

In the manganese mineralized district of Ultevis [M.A. **10**–492, **11**–472–3] some pegmatites are shown to contain scapolite (Ma 60–Me 40), which is in part altered to an argillitic substance. Chemical, microscopical, X-ray, and d.t.a. examinations demonstrate that the scapolite by means of barium-carrying hydrothermal solutions changed into harmotome, montmorillonite, and kaolinite. D.t.a. curves are given for the different minerals, together with *d*-values for scapolite, argillized scapolite, and harmotome. Chemical analyses of scapolite (A) and argillized scapolite (B) gave :

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	52·23	25·00	0·10	0·30	—	0·05	0·43	8·87	6·72	0·78
B	46·88	29·50	0·0	0·22	0·02	0·0	0·13	0·51	0·83	0·76

	BaO	P_2O_5	SO_3	Cl	F	scap. CO_2	carb. CO_2	H_2O+	H_2O-	Total
A	0·12	0·05	0·35	1·97	0·5	1·28	0·18	1·18	0·29	100·40
B	5·00	0·04	0·01	—	0·03	—	—	13·61	2·46	100·00

P. Lggn.

[Vasilevsky (M. M.)] Василевский (М. М.). Зональность и рудная минерализация сольфатарно-измененных пород Быстринского района Камчатки. [*Zonality and ore mineralization of the solfatara-altered zones of the Bystrinski region of Kamchatka.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 277–289, 4 figs.

This is a detailed study of vertical and horizontal zonin in the pneumohydrothermally altered sedimentary rocks one of the volcanic regions of Kamchatka. Six groups altered rocks are distinguished : (1) epidotized, chloritize albitized and pyritized ; (2) chloritized, carbonatized an pyritized ; (3) sericitized and pyritized ; (4) kaolinized (5) monoquartz rocks and opalites ; (6) alunitized rocks. S. I. T.

Brotzen (O.). *Some microstructures in jasper from th Långban mine, Sweden.* Geol. Fören. Förh. Stockholm 1955, **77**, 275–283, 10 figs.

The iron ores of the Långban Mine show zoning with core of hematite and faintly banded jasper, and outer part of magnetite and skarn minerals. The magnetite is pro bably formed by reaction of the hematite-jasper wit surrounding dolomite. The hematite-jasper, representin the original nature of the deposit, shows a number of sma structures such as stratification, ellipsoidal bodies, shrinka cracks, growth stages of quartz crystals and metasomati replacement by hematite. An intricate network of fin cracks, now filled with clear silica, traverses the jaspe this was formed as a gel and its banding represents th original stratification. The spherulitic texture round so of the ellipsoidal bodies may be due to an early rearrang ment of the jasper into low-temperature cristobalite. Th siliceous gel later was fractured and the cracks were fille with clear silica gel. An ultimate volcanic source of th iron and silica is discussed. E. Å-n.

Francis (G. H.). *Petrological studies in Glen Urquhar Inverness-shire. I. Limestones. II. Skarns.* Bul Brit. Mus. (Nat. Hist.), Min., 1958, **1**, no. 5, 123–16 10 figs., 3 pls.

A siliceous magnesian limestone has been metamorphose under lower amphibolite facies conditions leading to th crystallization of calcite, quartz, plagioclase feldspar (albit to andesine), microcline, zoisite (one crystal has a core o α-zoisite with O.A.P. ∥ (010), $2V\gamma$ 56°, $r>v$ strong, anoma lous blue birefringence, and a partial rim of β zoisite wit O.A.P. ⊥ (010), $2V_\gamma$ 7°, $r<v$ distinct, first order gre birefringence), clinozoisite-epidote, amphibole, pyroxen and phlogopite. The assemblages calcite-microcline-phlogo pite and calcite-quartz-phlogopite are both shown to b stable. A later metasomatic episode linked with nearb alkali injection, pegmatitic invasion and feldspathizatio has produced calc-alumino-silicate reaction skarns by th mingling of silica and volatiles with alumina from a kyanit schist horizon and lime from underlying metamorphose limestone. The skarns are considered in three groups epidosites, epidote-hornblende skarns, and plagioclas skarns ; pale-amphibole skarns ; prehnite and pectolit

skarns. Minerals recorded include both α and β zoisite (β zoisite commoner), thulite, clinozoisite, epidote, amphibole, pyroxene, plagioclase, chlorite, hydrobiotite, prehnite (mostly biaxial, +, 2V moderate, birefr. 0·020, but one vein gave several uniaxial, −, crystals and one crystal with α 1·612, β = γ 1·652, $2V_\alpha \approx 0°$), pectolite, and xonotlite (elongation +, birefr. ≈ 0·014, refr. ind. ∥ elongation 1·587; X-ray powder data listed). Chemical analyses by D. I. Bothwell and K. C. Chaperlin are given for magnesia-rich hornblende (A) from hornblende-epidote-plagioclase-quartz-calcite skarn, north of Lochan an Torra Buidhe; magnesia-rich hornblende (B) from pale amphibole-plagioclase skarn, north-west of Loch an Sgòr Gaoithe; and waxy-white diopside (D) from diopside-zoisite-amphibolite-calcite skarn, Sgòr Gaoithe; together with an analysis by K. C. Chaperlin (using the rapid method) of magnesia-rich hornblende (C) from pale amphibole skarn, small quarry, south east of largest quarry, Upper Gartally, and an analysis by G. H. Francis of leek-green salite (E) from salite-hornblende-zoisite-calcite-prehnite skarn, Sgòr Gaoithe. Analyses are also given of a kyanite-garnet schist and a prehnite-pectolite skarn : trace elements have been determined for the minerals and rocks chemically analysed.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	52·51	0·22	5·12	2·45	5·28	0·15	18·21	12·86	0·73	0·25
B	52·87	0·28	6·40	1·12	2·37	0·06	20·52	13·50	0·56	0·12
C	52·4	0·2	7·1	—	3·4	0·1	19·7	13·4	0·9	0·4
D	53·65	0·04	1·89	0·58	1·53	0·09	16·23	25·30	0·19	tr.
E	52·96	0·10	1·21	0·49	6·00	0·56	14·02	24·29	0·36	0·02

	H_2O+	H_2O-	F	Total	α	β	γ	2V	γ : c	D g/cc
A	1·88	0·09	0·40	99·98	1·623	1·634	1·642	83° −	18°	3·05
B	1·60	0·09	0·30	99·66	1·615	1·627	1·638	88° −	18°	3·01
C	2·2	—	0·58	100·14	1·613	1·623	1·637	84° −	20°	3·02
D	0·47	0·07	—	100·04	1·665	1·672	1·695	57° +	39°	3·28
E	0·23	0·20	—	100·44	1·677	1·686	1·706	58° +	41°	3·34

(Totals adjusted : A, O≡F 0·17 ; B, O≡F 0·13 ; C, O≡F 0·24).

[M.A. **13**–472] R. A. H.

[Korzhinsky (A. F.)] Коржинский (А. Ф.). Скарновые образования в Оспинском гипербазитовом массиве в Восточном Саяне. [*Skarn formation in the Ospinsky ultrabasic massif in Eastern Sayan mountains.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87**, 327–347, 9 figs.

Skarns in serpentinite are described and chemical analyses of rocks and minerals are given as well as some d.t.a. and X-ray data. These skarns are made of diopside, idocrase, garnet, chlorites, and other minerals. They form vein-like bodies in serpentinite and their relation to intrusive granite bodies is conjectural. The mechanism of metasomatism involved is discussed. S. I. T.

[Komarov (P. V.)] Комаров (П. В.). О связи образования магнезиальных скарнов с гранитизацией. [*On the connection between the formation of magnesian skarns and granitization.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Geol. Ser.], 1959, **5**, 90–102, 7 figs.

Forsterite-spinel skarn and iron ores found in the contact zone of granites with the Lower Palaeozoic strata of Zhelezny Kryazh in the Eastern Transbaikal region, are described and 10 chemical analyses of rocks are given. The process of formation of the magnesian skarns is through the action of the infiltrating solutions emanating from the granitic magma. The effects of assimilation of the country rocks on the invading magma are also discussed. S. I. T.

[Kazitzin (Yu. V.)] Казицын (Ю. В.). Метод молекулярных объемов и его применение при изучении измененных пород. [*The method of molecular volumes and its application to the study of altered rocks.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (2), 181–196.

After criticising the method of constant volume and the method of the 'standard cell' of Barth [M.A. **10**–423], the author proposes to use the method of molecular volumes for the study of mineral transformations in metasomatites. The molecular volume of a given mineral is calculated from the formula and X-ray density. Several cases are discussed. S. I. T.

[Rozentzvit (A. O.)] Розенцвит (А. О.). Гидротермальный метасоматоз протерозойских пород Олекмо-Витимской горной страны. [*Hydrothermal metasomatism of Proterozoic rocks of the Olekmo-Vitim highland.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Geol. Ser.], 1959, **5**, 74–89, 7 figs.

Metasomatized siltstones and sandstones are described and 19 chemical analyses are given together with gain and loss calculations. The rocks are alevrolite, albitite with ankerite porphyroblasts, biotite schist and others. Alkali metasomatism is revealed mainly by the phenomena of albitization, microclinization, and biotitization. Details of these and other processes are discussed. S. I. T.

[Kuman (V. E.)] Куман (В. Е.). О некоторых особенностях натрового метасоматоза в Криворожском бассейне. [*On certain features of soda metasomatism in the Krivoy Rog basin.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **125**, 1100–1102, 1 fig.

Soda metasomatism in the iron field of Krivoy Rog manifests itself in the formation of albite and alkali-amphibole in veins. Analysis of the alkali-amphibole : SiO_2 52·10, Al_2O_3 0·74, Fe_2O_3 17·66, FeO 13·37, MgO 6·03, CaO 1·35, Na_2O 7·40, K_2O 0·04, CO_2 0·36, H_2O+ 1·32, H_2O- 0·23, =[99·60] ; optical properties are α 1·690, γ 1·694, 2V(−) 80°, pleochroism α yellowish-brown, β blue, γ dark blue, negative elongation, extn. angle against elongation 3°–5°. X-ray study shows a structure identical with that of crocidolite from South Africa. D.t.a. shows an endothermal effect

at 930°–953°C. The name given to this mineral is magnesium riebeckite, and to its fibrous variety—magnesium crocidolite. [A.M. **43**–797 ; M.A. **14**–144, 145] S. I. T.

[Pavlenko (A. S.)] Павленко (А. С.). Особенности метасоматоза в одном из районов Северного Криворожья. [*Specific features of metasomatism in one of the districts of Northern Krivorozhie.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R. Geol. Ser.], 1959, **1**, 81–101, 7 figs.

This work is based on consideration of a number of chemical analyses of schists and minerals, such as cummingtonite and hydrobiotite, from the region of the iron ore field of Krivoy Rog. It is concluded that all the rocks in question originated through one single hydrothermal-metasomatic process, and that both infiltration and diffusion played a part. The metasomatic rocks show zonal structure determined by the order of mobility of components. The composition of the original hydrothermal solution was presumably of the nature of sodic carbonate. S. I. T.

Baragar (W. R. A.). *Nepheline Gneisses of York River, Ontario.* Proc. Geol. Assoc. Canada, 1953, **6**, 83–111.

Mineralogical, lithological, and chemical analyses of nepheline gneisses and associated rocks at York River, Ontario, suggest that the nepheline gneisses have been formed by the replacement of calcareous sedimentary rocks. Amphibolite, paragneiss, and massive pyroxene-garnet interlayers apparently represent unreplaced remnants of the preexisting sedimentary rocks. Chemical analyses of garnet, pyroxene, two a mphibolites, nepheline-rich rock, and nepheline-deficient rock are cited and the formulae of the nepheline-rich and nepheline-deficient rocks, calculated after the method of Barth, indicate that the nepheline-rich member has been produced by the addition of alkalis, alumina, and carbon dioxide and subtraction of magnesia, silica, and lime relative to the original calcareous sedimentary rock. [M.A. **14**–219] W. E. H.

Edwards (A. B.), Baker (G.), & Callow (K. J.). *Metamorphism and metasomatism at King Island scheelite mine.* Journ. Geol. Soc. Australia, 1956, **3**, 55–98, 4 figs., 2 pls.

A series of interbedded argillaceous and calcareous sediments together with basalt flows and pyroclastics were metamorphosed by a granodiorite stock at Grassy, King Island, in Bass Strait, giving narrow bands of hornfels and calcflinta. Subsequent pyrometasomatism gave rise to scheelite-bearing andradite skarn. The contact metamorphism has produced a series of forsterite-tremolite and forsterite-phlogopite-spinel rocks believed to represent altered picrite basalt. Chemical analyses are given of the granodiorite, four metamorphosed ultrabasic igneous rock six hornfelses including an anthophyllite-biotite hornfel seven metamorphosed impure and magnesian limestone and six marbles. Analyses by G. C. Carlos of : andradite (A handpicked from ore ; vesuvianite (B) from clots in narrow band at the contact of a marble bed and a garne pyroxene band ; coarse dark green epidote (C) from 'pod in the pyroxene-garnet hornfels ; actinolite (D) encrustin a vugh ; and scheelite (E) from a quartz-scheelite vei The scheelite mostly fluoresces yellow, but a few grair fluoresce blue or white ; spectrogr. anal. show that th major difference is that the yellow fluorescent scheelit contains about ten times more Mo. Other ore minera include molybdenite, arsenopyrite, pyrrhotine, pyrite chalcopyrite, sphalerite, native bismuth, bismuthinite josëite, bournonite, and galena. The chemical and volum changes during the metamorphism are discussed ; occasiona wollastonite is taken to indicate that the temperature of th contact metamorphism attained over 500°C, and the rock are considered to have cooled to about 400°C before pyro metasomatism occurred, the mineralizing solutions bein at about 600°C.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO
A	37·02	0·08	6·72	21·83	1·39	0·32	0·46	31·58
B	36·75	1·21	13·06	1·15	7·39	0·85	3·06	35·85
C	38·04	tr	13·10	23·42	0·84	0·22	0·31	23·33
D	45·21	0·02	8·33	5·92	17·86	0·06	7·16	12·39
E	—	—	—	—	1·37	0·05	0·03	17·90

	Na_2O	K_2O	P_2O_5	WO_3	MoO_3	H_2O+	H_2O-	Total
A	nil	nil	0·08	—	—	0·44	0·08	100·00
B	nil	nil	nil	—	—	0·64	0·09	100·05
C	0·20	0·05	0·01	—	—	0·38	0·09	99·99
D	tr	tr	0·02	—	—	2·57	0·45	100·01
E	—	—	—	76·71	1·54	0·22	—	99·61

D includes SO_3 0·02 ; E insol. 1·79.

R. A. H.

Francis (G. H.). *The amphibolite of Doir'a'Chatha (Durcha Sutherland.* Geol. Mag., 1958, **95**, 25–40, 1 fig., 1 pl.

The amphibolite is interpreted as a tholeiitic dolerite sill regionally metamorphosed and affected by alkali meta somatism. A new analysis (major and minor elements shows that the typical amphibolite is close to a tholeiite in composition. R. St J. L.

Petrology: metamorphic—regional

Thompson (James B., *Jr.*). *The graphical analysis of mineral assemblages in pelitic schists.* Amer. Min., 1957, **42**, 842–858, 9 figs.

At a given pressure, temperature, and humidity (activity of H_2O), quartz-bearing assemblages in the system SiO_2–Al_2O_3–MgO–FeO–K_2O–H_2O, whose phases include the principal minerals used as metamorphic indicators in pelitic schists, may be shown three-dimensionally in the tetrahedron Al_2O_3–MgO–FeO–K_2O. Assemblages which include muscovite as well as quartz may be represented in

wo dimensions by projecting the mineral compositions n to the plane Al_2O_3–MgO–FeO, with the composition Al_3O_5 as point of projection. This projection is applicable o rocks over a wide range of metamorphic conditions, and rovides a unique characterization of the mineral facies of elitic schists. Examples are also given of an equivalent rojection to a plane including the edge MgO–FeO and arallel to the edge Al_2O_3–K_2O. In plotting the composition f minerals containing extraneous components it is suggested that not only the CaO and MnO be subtracted but lso the equivalent Al_2O_3, K_2O, etc. so that the material ubtracted represents an independently variable component f the mineral itself. The principal variation in composition f most of the minerals involved is given by the ratio MgO/(MgO+FeO), this ratio being determinable by measurement f optical or other physical properties. [M.A. **12**–615]

R. A. H.

Lapadu-Hargues (Pierre). *Remarques sur les variations énergétiques au cours du metamorphisme.* Sciences de la Terre, 1955, no. hors série, 285–289.

Applying A. Fersman's energy constants [M.A. **11**–460] to the seven stages established by J. Jung and M. Roques for the metamorphism of a siliceo-aluminous sediment, the author believes he can show that there is no change in internal energy in the course of that metamorphism.

E. J.

Francis (G. H.). *Facies boundaries in pelites at the middle grades of regional metamorphism.* Geol. Mag., 1956, **93**, 353–368, 4 figs.

The decomposition of staurolite and of muscovite under increasing T conditions are discussed and the probable positions of their decomposition curves on a PT diagram considered in relation to the polymorphism of Al_2SiO_5. It is proposed that the reaction $3St+2Qz=Alm+5Ky+3H_2O$ be used to define the boundary between the epidote-amphibolite and amphibolite facies. Current facies and sub-facies are discussed and their positions on a PT diagram depicted. Some specific examples of metamorphic trends are related on the proposed PT-facies diagram. Following Thompson [M.A. **12**–615] a negative slope is adopted for the PT curves under conditions of regional metamorphism. Numerous references are given. R. St J. L.

Clifford (T. N.). *The stratigraphy and structure of part of the Kintail district of southern Ross-shire: its relation to the Northern Highlands.* Quart. Journ. Geol. Soc., 1957, **113**, 57–92, 7 figs., 2 pls.

The relationships of Moine schists, Lewisianoid rocks, and Lewisian gneisses are discussed in terms of a nappe theory. Four new analyses of rocks are given, three of Moine schists and one of hornblendic gneiss [cf. a hornblende diorite] of the Lewisianoid group. A garnet from the Moine schists gave SiO_2 36·93, Al_2O_3 21·50, Fe_2O_3 1·12, FeO 32·33, MnO 2·66, MgO 3·37, CaO 2·05, H_2O+ 0·20, =100·16, corr. to $Alm_{78\cdot2}Py_{11\cdot4}Sp_{6\cdot0}And_{3\cdot6}Gr_{2\cdot8}$. R. St J. L.

Lambert (R. St J.). *A metamorphic boundary in the Moine Schists of the Morar and Knoydart districts of Inverness-shire.* Geol. Mag., 1958, **95**, 177–194, 6 figs.

Some results of a re-investigation of this area are described, together with a new map, and structural and petrographic evidence for the nature of the metamorphic boundary. The Moine–Sub-Moine unconformity is replaced by a metamorphic boundary, between the core and envelope of an anticline. The core and envelope are no longer believed to be separated by a thrust, but by a zone of transition between two metamorphic states, which transgresses the geological boundaries. The lower grade of the core-schists is attributed to retrogressive metamorphism. G. M. B.

Leake (B. E.). *Composition of pelites from Connemara, Co. Galway, Ireland.* Geol. Mag., 1958, **85**, 281–296.

Seventeen new pelite analyses ('rapid methods') are given and use is made of Niggli numbers to demonstrate approximate constancy of composition. Analyses of a staurolite, garnet (refr. ind. and cell size given), and biotite are tabulated. R. St J. L.

Snelling (N. J.). *Further data on the petrology of the Saxa Vord schists of Unst, Shetland Isles.* Geol. Mag., 1958, **95**, 50–56, 1 fig.

Seven new analyses of staurolite-, kyanite-, chlorite-, and chloritoid-schists are given and their facies status discussed. A garnet from a polymetamorphic garnet-chlorite-muscovite schist gave SiO_2 37·82, Al_2O_3 21·60, TiO_2 0·58, Fe_2O_3 0·50, FeO 33·31, MnO 0·20, MgO 1·07, CaO 5·05, =100·13; n 1·812±0·003. R. St J. L.

Snelling (N. J.). *Notes on the petrology and mineralogy of the Barrovian metamorphic zones.* Geol. Mag., 1957, **94**, 297–304, 1 fig.

An antipathy of chloritoid and biotite is found in the greenschist facies and in the chloritoid-almandine subfacies of the albite-epidote amphibolite facies, chloritoid and biotite being separated on an AKF diagram by chlorite and garnet for these facies respectively. Thirteen new analyses of pelitic schists are given, the assemblage in each case except one (staurolite-bearing) agreeing with the chemistry. Six new analyses of biotite from these pelitic schists suggest that Al replaces Si more extensively in the higher grades, but that FeO/MgO and TiO_2 do not vary systematically with increase of grade. R. St J. L.

Read (H. H.) & Farquhar (O. C.). *The Buchan anticline of the Banff nappe of Dalradian rocks in Northeast Scotland.* Quart. Journ. Geol. Soc. London, 1956, **112**, 131–156, 5 figs., 3 pls.

The Dalradian is divided into a Lower division containing the Ellon gneisses, separated by a tectonic boundary from an Upper division containing quartzite and rocks of the greywacke sedimentary facies. The stratigraphy and structure of the Upper Dalradian is detailed, with accompanying maps ; the petrography of the metamorphic rocks is outlined. In pelites andalusite and cordierite occur with rare sillimanite ; in impure calcareous rocks diopside is recorded. The metamorphism followed the folding and the isograds form an 'anticline' lying two miles west of the tectonic anticline. R. St J. L.

Sandréa (André). *Sur la presence de quartzites et de chloritoïdites dans deux îles de la baie de Morlaix : les Duons et le Menk (Finistère).* C.R. Acad. Sci. Paris., 1956, **242**, 1639–1641.

The Menk rock and the Duons (at the N.W. end of Morlaix Bay) are composed respectively of quartzite (Menk) and of muscovite-chloritoid rock and quartzite with rutile and staurolite (Duons), the latter being traversed by an ophitic dolerite. E. J.

Dutt (Amitava) & Laporte (Jean). *Application aux schistes lustrés de Bastia (Corse) du principe de comparaison des facies pétrographiques.* C. R. Acad. Sci. Paris, 1955, **241**, 77–79.

The 'schistes lustres' of Bastia are not separable petrographically from the pre-Coal Measures beds of Osani. Three main lithological facies are found in the Bastia region and in the Osani basin : (1) sericitic schists, with a bluish tinge, composed of quartz and sericite as the main minerals, with albite, calcite, biotite, and graphite ; (2) green schists composed of sericite and quartz along with chlorite, epidote, albite, and actinolite ; (3) a complex of basic and ultrabasic rocks penetrating the schists. E. J.

Michel (Robert). *Contribution à l'étude zonéographique des schistes cristallins de la zone du Piémont. Paléozonegraphie des massifs cristallins internes.* Trav. Lab. Géol. Fac. Sci. Univ. Grenoble, 1956 (for 1954–55), **32**, 95–109. E. J.

Atkinson (D. J.). *The occurrence of chloritoid in the Hecla Hoek formation of Prince Charles Foreland, Spitsbergen.* Geol. Mag., 1956, **93**, 63–71, 1 pl.

Chloritoid is confined to narrow bands of restricted composition lying within deformed zones. The chloritoid developed contemporarily with the deformation and postdates the other micaceous minerals. It occurs within biotite and chlorite zones ; stress may be one of the fac involved in its production. R. St J. L

[Soloviev (S. P.)] Соловьев (С. П.). О зональнс кристаллических сланцев Центрального Кавказа и генезисе. [*The zones of crystalline schists of the Cen Caucasus and their genesis.*] Зап. Всесоюз. Мин. О [Mem. All-Union Min. Soc.], 1958, **87** (6), 633–646.

The metamorphic zones of the schists of the Cen Caucasus are : biotite-muscovite-chlorite zone, garnet zo andalusite zone, and sillimanite-tourmaline zone. paragensis of minerals is studied and its bearing on genesis of zones is discussed. A comparison is made w other similar zones in Eastern Siberia, Tian-Shan, Scotla Japan, and U.S.A. S. I. T

Van de Steen (J.). *Contribution a la géologie du s katangais. Le rétrometamorphisme d'amphibolites formations de la Lukumbi au contact de pegmat kibariennes.* Ann. Soc. Géol. Belgique, 1953–1954, M3–86, 10 figs., 1 map, 33 photomicros.

After describing the geomorphology and the tecton of the region the physical chemistry of the Khibarian ro and of the Lukumbi is studied. In each unit the sediment rocks and their associated eruptives are in equilibrium. deep epizonal facies is deduced for the Khibarian, a d mesozonal for the Lukumbi formations. The metamorphi induced in the basic rocks by pegmatites is studied detail, lithological facies being classified according to intensity of the metamorphism. The grade of metam phism permits distinction of the two systems when they present together in the Lukumbi region. J. M

Lillie (A. R.) & Mason (B. H.). *Geological reconnaissa of the district between Franz Josef Glacier and Copl Valley.* Trans. Roy. Soc. New Zealand, 1955, 1123–1128, 5 figs.

A map shows the following metamorphic zones for central portion of the Southern Alps of New Zealan Chl. 1, Chl. 2, Chl. 3, Chl. 4, biotite, garnet. D. S. C

Turner (Francis J.). *Origin of piedmontite-bearing qua muscovite-schists of north-west Otago.* Trans. R Soc. New Zealand, 1946, **76**, 246–249.

It is suggested that the parent rocks of quartz schists Otago carrying muscovite, piemontite, iron-ores, ma ganese-garnet, and tourmaline [M.A. **8**–19] were derived chemical precipitation from sea-water into which ir manganese, and silica had been introduced from submar volcanic springs. D. S. C

Vellman (H. W.), Grindley (G. W.), & Munden (F. W.). *The alpine schists and the Upper Triassic of Harpers Pass (Sheet S52), South Island, New Zealand.* Trans. Roy. Soc. New Zealand, 1952, **80**, 213–227, 10 figs.

Lithological criteria, including the incoming of quartz veins, are used to define grade of metamorphism in a belt of rocks ranging from Triassic greywackes and argillites to 'foliated' (laminated) schists. D. S. C.

Miyashiro (A.) & Seki (Y.). *Mineral assemblages and subfacies of the glaucophane-schist facies.* Japanese Journ. Geol. & Geogr., 1958, **29**, 199–208, 2 figs.

The definition of mineral facies is discussed and two subfacies of the glaucophane schist facies are proposed. One is characterized by the stability of glaucophane and epidote and the instability of lawsonite, pumpellyite, and almandine : the other is characterized by the stability of glaucophane, lawsonite, pumpellyite, and epidote and the instability of almandine. The status of eclogite in the facies series in relation to glaucophane schists is examined. For an eclogite from Gongen-yama, Bessi district, in the Sanbagawa-Mikabu zone, the clinopyroxene had α 1·676, β 1·684, γ 1·703, 2V 60°, $c : \gamma$ 43° ; chemical analysis gave SiO_2 51·86, Al_2O_3 1·02, TiO_2 0·20, Fe_2O_3 0·99, FeO 1·73, MnO 0·02, MgO 17·09, CaO 25·24, Na_2O 0·08, K_2O 0·06, H_2O 2·13, = 100·42. Garnet from the same eclogite had n 1·756, sp. gr. 3·4, a 11·555 ± 0·010Å ; composition SiO_2 39·68, Al_2O_3 22·05, TiO_2 0·98, Fe_2O_3 4·10, FeO 11·33, MnO 1·57, MgO 13·63, CaO 6·75, Na_2O 0·19, K_2O 0·04, H_2O 0·28, = 100·60 : both analyses by H. Haramura. [M.A. **6**–294, **11**–200, **12**–41, and following abstract] R. A. H.

Miyashiro (Akiho) & Banno (Shohei). *Nature of glaucophanitic metamorphism.* Amer. Journ. Sci., 1958, **256**, 97–110.

Glaucophanitic metamorphism is metamorphism that produces glaucophanites, i.e., rocks containing substantial amounts of glaucophane. If the riebeckite-glaucophane group is classified on the basis of $y = Fe^{2+}/(Fe^{2+} + Mg)$ and $x = Fe^{3+}/(Fe^{3+} + Al)$ (excluding Al replacing Si), systematic variations of optic orientation and of geologic occurrence become apparent. Specimens with $x < \cdot3$, $y < \cdot5$ are called glaucophane proper ; $x < \cdot3$, $y > \cdot5$, ferro-glaucophane ; $\cdot3 < x < \cdot7$, sub-glaucophane ; $x > \cdot7$, $y < \cdot5$, magnesio-riebeckite ; and $x > \cdot7$, $y > \cdot5$, riebeckite. However, 'glaucophane in a broad sense' includes all members of the group with $x < \cdot7$. Riebeckite occurs in alkalic igenous rocks, in crystalline schists, and in metamorphosed ironstone (as crocidolite) ; magnesioriebeckite occurs rarely in alkalic igneous rocks, more commonly in crystalline schists, etc., subglaucophane and glaucophane proper occur only in crystalline schists and associated rocks ; ferroglaucophane is unknown except for rare cases with y close to ·5. Mapped glaucophanitic metamorphic terranes in the Omi district and in the Kanto Mts., Japan, show that glaucophane is confined to the areas of lower metamorphic grade. Stability relations are discussed using field, and published laboratory data for jadeite-aegirine, epidote-pumpellyite-lawsonite, and are compared with relations of glaucophane-riebeckite. [A.M. **43**–797 ; M.A. **14**–144, 145] H. W.

Arnould (A.). *Phénomènes de métamorphisme dans le nord-est de la Nouvelle-Calédonie.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 142–146.

Two main groups of metamorphic rocks are recognised in the area described. The first comprises products of regional metamorphism (métamorphisme général), and includes sericite slates and schists, mica schists occasionally with intercalations of gneiss, lawsonite-bearing chlorite schists, quartzites, and gneisses. Accompanying these are eruptive rocks comprising aplites, amphibolites, dolerites [both dolerites and diabases are mentioned], gabbros, and peridotites and serpentinites. The second main group consists of glaucophane-rich rocks. Brief details are given of the process of gradual 'glaucophanization' of the other metamorphic rocks and of the eruptive rocks accompanying them [M.A. **9**–274]. The structure and age of the metamorphic rocks, and problems concerning the main metalliferous deposits associated with them are briefly discussed. W. A. W.

Roever (W. P. de). *Tectonic conclusions from the distribution of the metamorphic facies in the island of Kabaena, near Celebes.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 71–81, 2 figs.

Apart from small Tertiary areas Kabaena Island [lying off the south-east peninsula of Celebes] consists of older rocks. The four main divisions are : peridotites and serpentinites ; crystalline schists of the amphibolite and epidote-amphibolite facies ; crystalline schists of the lawsonite-glaucophanite subfacies ; and a dynamometamorphic formation of limestones, calcareous phyllites, phyllitic greywackes and conglomerates, and subordinate spilitic rocks. Accompanying the usual minerals of the schists of the amphibolite facies are pumpellyite, prehnite, and a blue alkali-amphibole in some rocks. The main constituents of the lawsonite-glaucophanite subfacies are quartz, sericite, chlorite, albite, carbonate, lawsonite, and glaucophane ; locally some chloritoid and chloromelanite are found. The paper deals mainly with the tectonics of the various metamorphic rocks, and the geology of the island is compared with that of central Celebes. There is a brief discussion of the origin of the metamorphism producing the lawsonite-glaucophanite subfacies. W. A. W.

Taylor (S. R.). *The origin of some New Zealand rocks as shown by their major and minor element composition.* Geochim. Cosmochim. Acta, 1955, **8**, 182–197, 2 figs.

Analytical data are presented for Al, B, Ba, Ca, Co, Cr, Cu, CO_2, Fe, K, Mg, Mn, Na, Ni, P, Pb, Sc, Ti, V, Y, and Zr in 10 quartz-albite-biotite schists (Arahura series) and 7 green schists (Pounamu series) occurring in the biotite zone of regional metamorphism of greywacke. The data support the field and petrological evidence that the Arahura series were derived from greywacke-type sediments and that primary element distribution has not been appreciably altered by the metamorphism. The data indicate that the Pounamu series were derived from basic rather than ultrabasic igneous rocks. The existence of a gravity-differentiated layered sill in this series is shown by its element distribution pattern which, when compared with distributions for sills elsewhere, indicates that the sill and the enclosing Arahura series are overturned. [See following abstract] J. R. B.

Mason (Brian) & Taylor (S. R.). *The petrology of the Arahura and Pounamu series in the Kokatahi River, north Westland.* Trans. Roy. Soc. New Zealand, 1955, **82**, 1061–1070, 4 figs.

Biotite-bearing schists are assigned to the albite-epidote-amphibolite facies. Optical data for the Arahura 'series' of metamorphosed sediments include : green biotite γ 1·596 ; brown biotite γ 1·63–1·64 ; rare garnets n 1·792, 1·793 ; tourmaline ε 1·626, ω 1·650 ; chlorites γ 1·603, 1·610 ; epidote α 1·730, γ 1·762. Data for green schists derived from basic igneous rocks, here called 'Pounamu series' [contrast Bell & Fraser, Bull. New Zealand Geol. Survey, 1906, **1**, 70,] include the following : albite An_5 ; olive-green biotite γ 1·620–1·625 ; hornblende (Al_2O_3 14·4%) α 1·649, β 1·662, γ 1·669, $2V\alpha$ 70°, $\gamma : c$ 16°, X pale yellow, Y grass green, Z deep blue-green ; other blue-green hornblendes β 1·638, 1·649, 1·654, 1·665 ; chlorite α 1·594, γ 1·600 ; epidotes α 1·725, 1·735, β 1·743, 1·750, γ 1·760, 1·770, $2V\alpha$ 90°, 69° ; clinozoisite α 1·710, γ 1·720. [See preceding abstract]

D. S. C.

Delhal (J.). *Les massifs cristallins de la Lulua et de Lueta (Kasai).* Mém. Inst. Géol. Univ. Louvain, 1957, **30**, 213–280, 3 pls.

The massif of la Lulua, Kasai province, Belgian Congo, contains garnetiferous quarzto-feldspathic and orthopyroxene-bearing granitic rocks together with a variety of more basic types including both orthopyroxene- and garnet-bearing gabbroic rocks. Amphibolites, zoisite-amphibolites, hornblende-schists and orthopyroxene-dolerites are also represented. The Lueta massif is composed mainly of green schists and related types. Thirty-one new rock analyses are presented and an analysis of garnet from the garnetiferous acid rocks of la Lulua massif shows that the predo- nant molecule is almandine : optical data are tabulated the feldspars, pyroxenes, and amphiboles of the vari rock types of both massifs. The paragenesis of all th rocks is briefly discussed, with particular reference the charnockitic assemblages. [M.A. **13**–351, 677, **14**–154

R. A. H

Parras (Kauko). *On the charnockites in the light of a hig metamorphic rock complex in southwestern Finla* Bull. Comm. géol. Finlande, 1958, **181**, 137 pp., 24 fig 1 map.

This is a comprehensive study of the charnockites. Part I, a general reivew of the charnockite problem given. In Part II, there is a detailed description of t charnockitic rocks of West Uusimaa in Finland, includi extensive mineralogical study and several new chemi analyses of minerals : scapolite, a new analysis, and opti properties for 12 scapolites ; garnet (almandite-pyrop three new analyses and optical properties for 30 garnet biotite (ε pale yellowish brown, ω reddish brown), o new chemical analysis and 27 optical determination orthorhombic pyroxene (ferrohypersthene), 2 new chemic analyses and optical properties of 21 specimens ; monoclin pyroxene (salite-ferrosalite), 2 new analyses and opti properties for 26 clinopyroxenes ; hornblende, a n chemical analysis accompanied by optical constants for hornblendes. The paper includes ample analytical da on the content of minor constituents of the charnocki described. V. M.

Guimarães (Djalma). *Os charnockitos de Espírito San* Bol. Inst. Tech. Ind. Minas Gerais, 1956, **23**, 30 p 16 figs.

Rocks with charnockitic affinities are described from t State of Espírito Santo, eastern Brazil. They cont orthopyroxene, hornblende, biotite, diopside, quartz, ar perthite, orthoclase (occasionally microcline), apatite, a iron-ore and show some signs of cataclasis : they differ fr some charnockitic rocks from elsewhere in contain relatively abundant sphene. R. A. H

Assunçào (C. F. Torre de) & Coelho (A. V. Pint *The rocks with charnockitic affinities in Mozambiq* Prov. de Moçambique, Ser. Geol. e Minas—Mem Comunicaçoes, 1956, Bull **19**, 173–181, 1 map [Pr Pan Indian Sci. Congr., Sect. C, Perth, 1954, pp. 29–

Brief petrographic details are given of the 'Ango granites' which include pyroxene granites and basic py xene gneiss, and the 'brown granites' of the Tete distr which cover a series including pyroxene-granites, pyroxe granodiorites, tonalites, and hyperites. The charnock

ies in the Barué district comprises orthopyroxene-aring rocks ranging from granites to gabbros : the acid pes have a dark grey colour, gneissoid textures are mmon, and in some cases orthopyroxene is transformed o garnet. Chemical analyses are given for nine rocks.

R. A. H.

DULANGER (JAQUES). *Les anorthosites de Madagascar.* Serv. Géol. Madagascar, 1957, Trav. Bur. Géol., **79**, 67 pp., 9 figs., 2 pls.

Full paper of a preliminary note [M.A. **13**–411]. In the uth-west of Madagascar four large anorthosite-norite dies are interbedded in the basement complex, each dy having a coarse-grained core with anorthosite and persthenite and a gneissic periphery with gradual transi-on into the adjacent crystalline schists. In central adagascar gabbroic complexes occur with anorthositic fferentiates ; anorthositic hyperite cores are often sur-unded by hyperite which has been transformed into ronite, the whole mass being surrounded by charnockitic neisses. Eleven chemical analyses of the anorthosites and ssociated rocks are tabulated together with analyses of wo hypersthenes and an augite from the anorthosites. The northosites are interpreted as metagabbros formed by ltrametamorphism in the granulite facies : it is however ifficult to decide whether the original rocks were magmatic r whether they were genetically related to a sedimentary ycle. The relationship of the anorthosites to charnockitic ssemblages is discussed. The anorthosite-norite bodies of outh-west Madagascar contain ferrian ilmenite as the nly essential opaque mineral : analyses are given of menite, from the Ankafotia mass (A), the Saririaky mass B), and the Volovolo mass (C).

	SiO_2	TiO_2	Fe_2O_3	FeO	MnO	Total
A	0·8	51·2	8·0	39·7	0·6	[100·3]
B	1·8	49·2	9·4	36·7	0·9	[98·0]
C	2·1	53·3	10·9	33·0	0·6	[99·9]

R. A. H.

AMPSON (D. N.). *The Uluguru Mountains.* Rec. Geol. Survey Tanganyika, 1958, **5**, 21–35, 3 pls.

A pre-Cambrian meta-anorthosite complex, about 100 q. miles in area, intrudes banded granulites, graphitic neisses, and limestones ; 7 chemical analyses are given for nembers of anorthosite, gabbroic anorthosite, anorthositic abbro, and pyroxenite composition, and 6 partial analyses f titaniferous iron ores associated with the more basic ocks. Rocks resembling intermediate charnockites are riefly described. D. McK.

PFEFFER (H. W.). *Origin and metamorphism of Keewatin-type metadiabases ('Diorites') of the O'Sullivan Lake Area, Ontario.* Proc. Geol. Assoc. Canada, 1955, **7**, 83–98.

From a geological, mineralogical, textural, and chemical study of the Keewatin-type lava complexes in the O'Sullivan Lake area, Ontario, it is concluded that the so-called 'diorites' or 'dioritic greenstones' are the coarse-grained representatives of a plateau basalt complex. The original mineral assemblages have been transformed into new assemblages characteristic of the greenschist facies. It is suggested that the 'diorites' be termed metadiabases, and that the associated fine-grained basic lavas and pillow lavas be called metabasalts. The findings in this area are believed to be applicable in most areas where Keewatin-type lava complexes are found. J. L. D.

MARMO (VLADI). *On the use of ore minerals in the interpretation of the stage of metamorphism within the amphibolite and saussurite facies.* Norsk Geol. Tidsskr., 1953, **32**, 156–161.

Attention is drawn to the possibility of using ore minerals, especially the exsolutions observable in sulphides, in the interpretation of the metamorphic facies of the host rock. Experimental data on the maximum temperatures at which exsolution appears in a number of common sulphide minerals are quoted from literature and applied to two Finnish occurrences. One of these is a 'basic cluster' containing in its marginal parts hornblende and plagioclase and in its central part diopside and plagioclase, while the ore minerals are similar throughout. The whole 'cluster' is interpreted as being in amphibolite facies, the mineral association of the central parts then being due to lack of water. I. W. O.

MURTHY (M. V. N.). *Coronites from India and their bearing on the origin of coronas.* Bull. Geol. Soc. America, 1958, **69**, 23–38, 12 figs.

'Coronas' (rims believed to be of metamorphic origin) surrounding olivine, magnetite, and spinel in metadolerites are described in detail. Olivine commonly shows two coronas, the inner one of rhombic pyroxene replacing the olivine ; and the outer one of amphibole, amphibole-spinel, and/or garnet developed by replacement of plagioclase. Magnetite and spinel have coronas of biotite, amphibole, or garnet. The cause and mechanism of the reaction between olivine, magnetite, or spinel with the adjacent plagioclase are examined from a crystallochemical point of view, and inferences as to the metamorphic conditions are made. A number of differences between coronas and reaction rims of magmatic origin are discussed. A. L. A.

BROWN (P. E.). *An occurrence of soapstone in a migmatitic environment, Central Province, Tanganyika.* East-Central & Southern Regional Committees for Geology, Proc. Second Meeting, Tananarive, 1957, 177–182.

Two small circular bodies of ultrabasic rock, about 40 yards in diameter, occur at Karema, 90 miles north of Dodoma, Tanganyika, in an area of migmatitic gneiss. The ultrabasic bodies are zoned, with an outer zone, 50 feet wide, of actinolite and an inner zone of soapstone with variable proportions of talc, gedrite (optically negative anthophyllite), actinolite, and chlorite. The original peridotite or serpentinite is believed to have been converted to gedrite by addition of Si and possibly Al and expulsion of Fe and Mg ; at the margins actinolite was formed by the addition of Si and Ca from the migmatites together with the removal of Mg and possibly Fe. With falling temperature and continuing abundant aqueous solutions talc developed, but only in the centre of the bodies where the chemical environment was most favourable. [M.M. **23**–519 ; M.A. **7**–43, **12**–398] R. A. H.

Chenevoy (Maurice). *Sur l'origine des éclogites de Sauviat (Creuse)*. C.R. Acad. Sci. Paris, 1955, **241**, 426–428.

Detailed examination of the eclogite mass of Sauviat in the massif Central of France affords useful evidence on the origin of eclogites. The eclogites of this region originate from gabbros of ordinary kind and represent a stage of their transformation under the influence of regional metamorphism. 6 partial analyses. E. J.

Knorring (O. von) & Kennedy (W. Q.). *The mineral paragenesis and metamorphic status of garnet-hornblende-pyroxene-scapolite gneiss from Ghana (Gold Coast)*. Min. Mag., 1958, **31**, 846–859, 6 figs.

Pyroxene- and scapolite-bearing rocks occur as variants of the common garnetiferous hornblende gneisses of Dahomeyan (Archaean) age in the Shai Hills, south-east Ghana. Analyses by M. H. Kerr are given for a garnet-hornblende-scapolite gneiss (A) from the inselberg Mapong, with approximately 20% scapolite, and of an otherwise normal garnet-hornblende-pyroxene gneiss (B) with about 2% scapolite ; together with analyses by O. von Knorring of the garnet (C) n 1·773, a 11·59Å, sp. gr. 3·93 ; clinopyroxene (D) α 1·689, β 1·699, γ 1·718, $2V_\gamma$ 64°, sp. gr. 3·35 ; hornblende (E), α 1·659, β 1·673, γ 1·678, $2V_\alpha$ 75°, $\gamma : c = 13°$, sp. gr. 3·22 ; and scapolite (F), ω 1·587, ε 1·564, sp. gr. 2·72 ; all from the Mapong garnet-hornblende-scapolite gneiss. A revised scheme for the distribution of mineral facies within the temperature-pressure field of metamorphism is proposed.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O
A	42·12	0·89	18·95	4·36	9·50	0·20	7·63	11·26	2·76
B	50·00	1·00	19·53	2·85	5·55	0·07	5·59	9·28	4·48
C	39·50	0·16	21·53	1·05	20·91	0·66	7·85	8·34	—
D	49·60	0·62	6·12	3·80	5·86	0·10	11·26	20·58	1·68
E	41·86	1·90	14·31	4·29	8·79	0·10	12·58	11·14	2·47
F	47·52	nil	25·21	—	0·30	0·02	0·14	15·48	4·52

	K_2O	P_2O_5	CO_2	Cl	SO_3	H_2O+	H_2O-	Total
A	0·28	0·09	0·60	—	0·86	0·84	0·02	100·36
B	0·32	0·32	0·20	—	0·09	0·64	0·00	99·92
C	—	—	—	—	—	—	—	100·00
D	0·05	—	—	—	—	0·25	0·05	99·97
E	0·63	—	—	0·07	—	1·84	0·08	100·06
F	0·10	0·03	2·16	0·06	4·17	0·22	0·08	100·01

(C) also includes Cr_2O_3 tr.

R. A. I

Johnston (W. G. Q.). *Geology of the Temiskaming-G ville contact southeast of Lake Temagami, Nort Ontario, Canada*. Bull. Geol. Soc. America, 1954, 1047–1074.

The gneisses in the Grenville sub-province immedia east of the contact are similar in chemical compositio the granites of the Temiskaming sub-province and considered to be their metamorphosed equivalents. T gneisses are cut by younger granitic rocks which are in potash and which probably originated, in part at le by granitization. Structural details are given, with st tical and fabric diagrams. The Grenville gneisses are in amphibolite facies : the properties of several biotites garnets from these gneisses are listed. An analysis by H Wiik of a garnet from an andesine-biotite-quartz-alman rock, gave SiO_2 37·17, TiO_2 0·20, Al_2O_3 16·84, Fe_2O_3 FeO 28·51, MnO 3·41, MgO 5·53, CaO 1·75, Na_2O H_2O+ 0·20, H_2O- 0·00, S 0·07, (less O≡S 0·03), = 99 n 1·80, D 4·13, a 11·53Å. R. A. I

Lyons (J. B.). *Geology of the Hanover quadrangle, Hampshire-Vermont*. Bull. Geol. Soc. America, 1 **66**, 105–146, 12 figs., 3 maps.

In this area of metamorphosed eugeosynclinal format of probable Ordovician age two domal uplifts occur, being a synkinematic granite intrusive accompanied granitization while the other was produced by an upw welling of previously deformed plastic schists : a s ultramafic intrusive near the granite consists of a chlo anthophyllite-talc-magnetite-ankerite rock, the anthoph ite having α 1·615, β 1·630, γ 1·640. Regional meta phism has affected the interbedded sediments and volc rocks, the chlorite, biotite, garnet, staurolite, and kya zones being recognised : intensity of metamorphism creases towards the domal structures. Sporadic deve ment of as much as 5% of tourmaline is found in s schists and amphibolites, indicating boron metasomat The plagioclase-epidote equilibrium relationships are cussed, and it is shown that in general there is a gra increase in the anorthite content of the plagioclase increasing metamorphism provided that calcium is avai in the rock. R. A.

James (Harold L.). *Zones of regional metamorphism i Precambrian of northern Michigan*. Bull. Geol. America, 1955, **66**, 1455–1488, 4 figs., 5 pls.

Regional metamorphism which occurred during a post-uronian, pre-Keweenawan interval of orogeny and minor unite intrusion is clearly shown by mineralogical changes the Huronian iron formations, greywackes, and slates, d in the post-Huronian basic intrusive rocks. Zones of tamorphic intensity delineated by chlorite, biotite, rnet, staurolite, and sillimanite isograds or their equiva-ts are developed around four nodes, two of which lie in mediately adjacent parts of Wisconsin : chemical an-yses are given for eight rocks. The zones range from less an a mile to about 30 miles in width : analysis of the ermal gradients inferred indicates that the heat required r metamorphism must have been derived from sub-cent bodies of magma. Granites are most abundant in eas of strongest metamorphism, but field evidence shows at most of the masses were intruded after metamorphism.

R. A. H.

AQUE (J. M.), BAUM (J. L.), HERRMANN (L. A.), & PICKERING (R. J.). *Geology and structure of the Franklin-Sterling area, New Jersey.* Bull. Geol. Soc. America, 1956, **67**, 435–474, 18 figs., 3 pls. (1 map).

The pre-Cambrian rocks of the Franklin-Sterling area nclude metasedimentary, igneous, and probable meta-olcanic types. Some of the igneous rocks were probably ntruded as sills and phacoliths during deformation, whereas he granites and pegmatites were intruded as discordant odies during or after the last stages of deformation. Most f the pre-Cambrian rocks have reached the level of the illimanite zone of metamorphism but often show signs of ubsequent hydrothermal metamorphism. Modal analyses nd mineralogical details are given for microcline, horn-blende, and pyroxene gneisses and for the Byram gneiss : he latter contains microcline-microperthite and/or micro-line-antiperthite and may have had a complex history of gneous intrusion coupled with partial replacement. The well-known zinc ore deposits occur within a marble band, he ore body probably being introduced in the later stages f pre-Cambrian folding. The occurrence of detrital frank-inite in the lower part of the Hardyston quartzite (early Cambrian) demonstrates conclusively the pre-Cambrian age of the zinc mineralization. [M.A. **6**–261] R. A. H.

ECKELMANN (F. DONALD) & POLDERVAART (ARIE). *Geologic evolution of the Beartooth Mountains, Montana and Wyoming. Part I : Archean history of the Quad Creek area.* Bull. Geol. Soc. America, 1957, **68**, 1225–1262, 15 figs., 5 pls.

Detailed field studies indicate that the emplacement of metagabbro and ultramafic intrusions into an Archean sedimentary sequence was followed by folding and by regional metamorphism and granitization resulting in a core of granitic gneiss and a mantle of migmatites and metasediments. The boundary zone between core and mantle consists of interdigitating tongues of migmatites and granitic gneiss, these rock types grading into one another along and across the strike : growth phenomena shown by zircons from different rocks also indicate autochthonous formation of granitic gneiss. Mineral assemblages in resistant para-amphibolite, ultramafic rocks, biotite schists, and banded ironstones indicate metamorphism in the sillimanite-almandine subfacies of the amphibolite facies, with temperatures probably around 500° to 600°C. It is concluded that granitization was effected by migrating alkaline aqueous solutions during a prolonged Archean cycle of thermal activity. Chemical and modal analyses are given for twenty-three rocks together with optical data for some of their major constituents : some trace element data are also presented, and chemical variation during granitization is discussed. [M.A. **13**–450] R. A. H.

HAMILTON (WARREN B.). *Polymetamorphic rocks of Blue Ridge front near Old Fort, North Carolina.* Amer. Journ. Sci., 1957, **255**, 568–573, 1 pl.

Gneisses and intercalated metasediments, all of probable pre-Cambrian age, were pervasively sheared and slightly recrystallized and reconstituted. The resultant rocks are quartz-feldspar flaser and augen gneisses with subordinate schists and minor phyllites : the quartz, feldspars, and micas show crushing or bending with slight recrystallization. New mineral assemblages belong mostly to the biotite-chlorite subfacies of the greenschist facies. R. A. H.

ENGEL (A. E. J.) & ENGEL (CELESTE G.). *Progressive metamorphism and granitization of the major paragneiss, northwest Adirondack Mountains, New York. Part 1. Total rock.* Bull. Geol. Soc. America, 1958, **69**, 1369–1414, 7 figs., 4 pls.

Two types of metamorphism, in a belt of quartz-mica-feldspar-garnet paragneiss, about 35 miles long, are considered in detail. One is the progressive metamorphism of gneiss seemingly little altered in bulk composition from the parent sedimentary rock. The second type is the granitization of widely distributed parts of the little-altered gneiss. Geologic thermometers indicate temperatures of about 500°C at the southwest end of the belt and about 600°C near the perimeter of the Adirondack massif. Minimum temperatures of metamorphism in the gneiss are determined largely from solid solutions of magnesite in dolomite, FeS in sphalerite, paragonite in muscovite, and TiO_2 in magnetite. Maximum temperatures of metamorphism are inferred principally from the absence of wollastonite in closely associated siliceous marbles. The temperature gradient is confirmed by $^{18}O : ^{16}O$ ratios in quartz and

coexisting magnetite in the gneiss. The composition of the paragneiss and its constituent minerals is determined from 75 new chemical analyses, 50 partial chemical analyses, 400 analyses of trace elements, and approximately 400 modal analyses of rocks.

The mineral and compositional changes along the belt indicate that progressive metamorphism produces a 'basification' of the gneiss that began at about 550°C. Muscovite disappears, garnet appears, plagioclase increases in An content and abundance, and quartz decreases. Chemical changes include increase in Al, Fe^{2+}, total Fe, Mg, Ca, Cr, Ga, Ni, V and decrease in K, Si, Fe^{3+}, H_2O, and Ba. Granitization of parts of the gneiss involves increase in K feldspar and Ab content of plagioclase, and decrease in biotite, plagioclase, and quartz. Chemical changes include increase in K, Ba, and Pb and decrease in Ti, Fe^{3+}, Fe^{2+}, Mg, Ca, H_2O, Co, Cr, Ni, Sc, Sr, Ti, V, Y, and Na : K ratio. All granitizing material in areas of lower-temperature metamorphism appears to be introduced ; in areas of highest-temperature metamorphism only part is introduced, the rest being derived locally from the gneiss by the 'basification'. A. L. A.

Bellière (J.). *Contribution à l'étude pétrogénétique des schistes cristallins du massif des Aiguilles Rouges (Haute-Savoie)*. Ann. Soc. Géol. Belgique, 1957–1958, **81**, M1–198, 33 figs., 1 map, 29 photos.

The crystalline schists of the Aiguilles Rouge originate in an old series of sediments of unknown age and of composition ranging from clay to arkose. The metamorphism, which is contemporaneous with the tectonic deformation, shows an upper catagonal to lower mesozonal character. Three rock-types are recognized : fine-grained rocks in which all sedimentary structures are preserved ; medium-grained endomigmatic rocks with original stratification only preserved ; medium-grained homogeneous granitoid gneisses. Tectonic movement has caused, first, pla deformation with elongation and formation of isocli folds contemporaneous with the schistosity, secondly, l important folds and deformation of the schistosity, thirc development of segregation pegmatites in fractures af the mass became rigid. Fourteen analyses are given. J. M.

Zwart (Hendrick). *A propos des migmatites Pyrénéen* Bull. Soc. géol. France, 1956, **6**, 49–56.

In the migmatites of the Pyrenees a metasomatic additi of silica and soda has induced transformation of the schi to migmatites of the composition of quartz-diorite. T addition is of the order of 5–10%. The small veins of m matite are veins of replacement. There are two phases recrystallization in the migmatites: (1) synkinema (schistose migmatites), (2) static (with recrystallization part of the migmatite and formation of rocks of massi texture). During the static phase andalusite was form in the mica-schists. E. J.

Woodtli (R.). *Les migmatites de la région de Zani (Mi de Moto–Congo Belge)*. Ann. Soc. Géol. Belgique, 195 1955, **78**, B125–133, 1 fig.

Description of 4 migmatites, an aplite, and a pegmati These and the adjacent granite are of metamorphic origi J. M.

Jansen (H.). *Granitisation and metamorphism in t southern part of Namaqualand, South Africa*. Ko Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 195 **16** (Gedenkboek H.A. Brouwer), 167–175.

The processes of granitization and metamorphism of t sedimentary Malmesbury formation are described in tern of regional metamorphism and an initial phase of granitiz tion, followed by a second phase of granitization, a finally a third phase of intrusive activity. R. A. H.

VARIOUS TOPICS

Gaines (George L., *Jr.*). *Adhesion and ion-exchange between mica surfaces*. Nature, 1959, **183**, 1109–1110.

Radioactive ^{42}K has been used to show the interchange of ions between two mica surfaces when brought into contact. C. H. K.

Barrer (R. M.). *New selective sorbents : porous crystals as molecular filters*. Brit. Chem. Eng., 1959, **4**, 267–279, 12 figs., 9 tables.

A general review of the theory and use of alumino-silicates with open or porous anionic frameworks as molecular sieves. Data are given for various crystals, e.g., chabazite, mordenite, bentonites, etc., in separating gaseous mixtures c straight- and branched-chain hydrocarbons, noble gase etc. Their use as desiccants is discussed. G. S. G.

Rozhkova (E. V.), Rasumnaya (E. G.), Serebryakov (M. B.), & Shcherbak (O. V.). *The role of sorbtio in the process of uranium concentration in sedimenta rocks*. Proc. Sec. U.N. Intern. Conf. Peaceful Use Atomic Energy, 1958, **2**, 420–431, 6 figs., 10 tables.

Experimental data on the sorbent properties of organ material, phosphates, ferric hydroxides, kaolinite, an

ntmorillonite are given and discussed in relation to the umulation of uranium during sedimentation and dia- esis. J. R. H.

NTER (J. W.). *The direct study by electron microscopy of crystal lattices and their imperfections.* Proc. Roy. Soc., 1958, **236**, **A**, 119–135.

Thin crystals of copper and platinum phthalocyanine ve been studied in the transmission electron microscope. anes (20$\bar{1}$) of the lattice have been resolved, and imper- tions of various kinds directly observed. This elegant periment was one of the first to permit the photographing dislocations in a crystal. The explanation of the resolution hieved is based on the Abbe theory of image formation in e optical microscope. W. H. T.

KOVALEV (G. A.)] Ковалев (Г. А.). Влияние сухого растирания вещества на характер его дебаеграммы. [*The influence of dry grinding of a substance on the character of its X-ray powder photograph.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1957, **86**, 401–403, 4 pls.

Dry grinding of various minerals leads to partial or mplete disappearance of lines on the X-ray powder notographs. S. I. T.

BOKY (G. B.) & BATZANOV (S. S.)] Бокий (Г. Б.) и Бацанов (С. С.). Рефрактометрическое определение строения силикатов. [*Refractometric determination of the structure of silicates.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1957, **86**, 421–431.

The calculation of the refractivity of any set of postulated ructural models of crystals allows selection of one in hich the refractivity is close to the one which is based on bservational data. Examples given are those of kyanite, amsayite, and sphene, among other minerals. S. I. T.

BORNEMAN-STARYNKEVICH (I. D.)] Борнеман-Старынкевич (И. Д.). Химические формулы минералов. II. О формуле иринита. [*Chemical formulae of minerals. II. On the formula of irinite.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 207–212.

This is an elaborate calculation of the formula of irinite M.A. **12**–462] an X-ray amorphous (metamict) mineral. S. I. T.

BORNEMAN-STARYNKEVICH (I. D.)] Борменан-Старынкевич (И. Д.). Химические формулы минералов. III. О формулах гельбертрандита и бериллита. [*Chemical formulae of minerals. III. On the formulae of gelbertrandite and beryl.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **3**, 349–356.

This is an elaborate set of calculations and a critical review of the composition and formulae of these two minerals. [M.A. **14**–272]. S. I. T.

[LEONOVA (V. A.)] Леонова (В. А.). К минералогии и кристаллохимии уранинитов Северной Карелии. [*On the mineralogy and crystalchemistry of uraninites of Northern Karelia.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (1), 21–38, 5 figs.

This work is based on a number of previously published Russian works on uraninites and on 19 old and new chemical analyses. Uraninites of northern Karelia occur in pegmatite veins of pre-Cambrian age. Morphologically uraninites are subdivided into four varieties: (1) cubo-rhombohedron, (2) cube, (3) cubo-octahedron, (4) compact. The average chemical composition of these varieties are as follows: (1) UO_2 40·22, UO_3 31·31, PbO 17·66, ThO_2 1·31, TR_2O_3 6·37, rest 1·95,=98·82, sp. gr. 8·64; (2) UO_2 36·69, UO_3 33·88, PbO 19·34, ThO_2 2·16, TR_2O_3 4·77, rest 2·28,= 99·12, sp. gr. 8·61; (3) UO_2 37·33, UO_3 35·73, PbO 19·83, ThO_2 1·65, TR_2O_3 2·87, rest 3·24,=100·65, sp. gr. 8·36; (4) UO_2 26·56, UO_3 44·79, PbO 19·67, ThO_2 1·46, TR_2O_3 3·45, rest 2·42,=98·35, sp. gr. 8·19. The relations between the chemical composition, the degree of oxidation, the crystal-chemical structure, and the size of the unit cell are discussed. Factors influencing the process of oxidation are outlined. Considering all the isomorphous replacements, including those of radiogenic lead, the processes of oxidation and the partial loss of uranium, the formulae of uraninites should be calculated on a crystallochemical basis with a constant number of oxygen anions. S. I. T.

MITCHELL (RICHARD S.). *Structural polytypism and the spiral growth of crystals.* Virginia Journ. Sci., 1957, **8**, 329–330.

The polytypic structures of cadmium iodide and silicon carbide are believed to result from the spiral growth of crystals as a consequence of screw dislocations. Perhaps polytypes of wurtzite, graphite, mica, and clay can be explained by this mechanism. R. S. M.

[ILYINSKY (G. A.)] Ильинский (Г. А.). О параморфозах кальцита по фатериту. [*On paramorphs of calcite after vaterite.*] Доклады Акад. Наук СССР. [C. R. Acad. Sci. U.S.S.R.], 1958, **121**, 541–543, 3 figs.

Paramorphs of calcite after vaterite are found in cavities of a dolomitic carbonatite in Vuori-Yarvi, Northern Karelia, in the form of a combination of two flattish hexagonal pyramids, (11$\bar{2}$6), ϕ 90° 00′, ρ 34° 20′, and (02$\bar{2}$3), ϕ 60° 90′ [mistake for 59° 59′?], ρ 57° 41′ (average values). S. I. T.

Brasseur (H.). *Considérations nouvelles sur la constitution possible du phosphate tricalcique hydraté.* Bull. Acad. roy. Belgique, Classe Sci., 1958, sér. 5, **44**, 507–513.

A new theory of the constitution of hydrated tricalcium phosphate is presented : a continuous series of solid solutions would exist between hydroxyapatite $(Ca_3P_2O_8)_3 \cdot Ca(OH)_2$ and the hypothetical phosphate $Ca_4H(PO_4)_3$ which also would have an apatite structure. J. M.

[Chukhrov (F. V.) & Ermilova (L. P.)] Чухров (Ф. В.) и Ермилова (Л. П.). Новые данные о керченитах. [*New data on kerchenites.*] Вопросы геохимии и минералогии. Акад. Наук СССР. [Problems of Geochem. & Min. Acad. Sci. U.S.S.R.], 1956, 158–175, 5 figs.

Three new chemical analyses of kerchenites and a number of previously published analyses of various hydrous iron phosphates provide material for the calculation of formulae of these minerals, followed by optical, X-ray, and thermal study. It is concluded that in the process of oxidation of vivianite, kerchenites are formed first, later followed by oxykerchenite and bosphorite. Egueïite must be considered as an analogue of oxykerchenite, and tinticite is similar to bosphorite. The processes of formation of these minerals are discussed. S. I. T.

Thoreau (J.) & Bastien (G.). *Les phosphates des pegmatites du Ruanda occidental.* Bull. Acad. roy. Sci. colon., Sect. Sci. nat., Brussels, 1954, **25**, 1595–1603.

Chemical and spectrographic analyses, d.t.a. curves, and X-ray powder data are given for alluaudite, ferri-sicklerite, heterosite, and strengite [M.A. **12**–400]. Thermal analyses show strong analogy : an endothermic peak slightly above 200°C, due to the loss of loosely bound water without destruction of the crystal lattice. A chemical analysis of montebrasite is also given. [M.A. **13**–370] R. V. T.

Nakhla (F. M.). *Polianite pseudomorphs from Um Bogma, Sinai.* Egypt J. Geol., 1958, **2**, no. 2, 89–102, 5 figs. Summary in Arabic, ibid., 103.

The morphological and other properties of polianite crystals rarely present inside the cavities of some ore specimens from Um Bogma Mine, West Central Sinai, are given. The crystals are orthorhombic, with axial ratio 0·729 : 1 : 1·084. The crystal habit is characterized by deeply, vertically striated prisms, often terminated by steep pyramidal faces. A perfect cleavage is exhibited parallel to the side pinacoid (010). E. M. El S.

[Barabanov (V. F.)] Барабанов (В. Ф.). Флюорит Букукинского вольфрамитового месторождения (В точное Забайкалье). [*Fluorite from the Bukukin wolfra ite deposit (East Transbaikal region.)*] Зап. Всесо Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (126–136, 5 figs.

Various types of fluorite occurring in the quar wolframite veins intrusive into granodiorite are describe The paragenesis of fluorite types, regular succession crystal forms, and the luminescence of various colou crystals are discussed. S. I. T.

[Rundquist (D. V.)] Рундквист (Д. В.). О комплексна двойниках касситерита. [*Complex twins of cassiterit* Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc 1959, **3**, 225–233, 3 figs.

The results of measurement of complex 'twins of twi of cassiterite are given. The complex twins, the 'quadrup of triplets', 'octet of duplicates', are discussed. S. I. T.

[Bogolepov (V. G.)] Боголепов (В. Г.). О гематите скарнов месторождения Саяк I. [*On the hematite fr skarns of the deposit Sayak I.*] Зап. Всесоюз. Мин. Об [Mem. All-Union Min. Soc.], 1959, **88** (3), 343–346.

An occurrence of hematite in the Sayak I sulphides ska deposit in the N.E. Sub-Balkhash region is described a the paragenesis of the skarn minerals is discussed. S. I. T.

[Zhabin (A. G.) & Dikov (Yu. P.)] Жабин (А. Г.) и Дик (Ю. П.). О дендритовидном пирите. [*The dendritic pyrit* Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. So 1959, **3**, 331–333, 3 figs. S. I. T.

[Shaposhnikov (G. N.)] Шапошников (Г. Н.). Футляр образная форма кристаллов турмалина. [*The casel form of tourmaline crystals.*] Зап. Всесоюз. Мин. Об [Mem. All-Union Min. Soc.], 1959, **88** (3), 336–338, 3 fi

A tourmaline crystal enclosing a quartz crystal, found pegmatite of the S.E. Tuva is described. S. I. T.

[Pavlova (I. G.)] Павлова (И. Г.). О сферолитов агрегатах топаза. [*On spherulitic aggregates of topa* Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc 1959, **88** (2), 187–191, 6 figs.

Spherulitic aggregates of topaz in quartz and cassiter ore are found in the Karadub and Olonoisk tin deposit the Maly Khingan, Siberia. These deposits occur in hyd thermally altered quartz porphyries. The spherulitic agg gates and the 'tourmaline suns' are described and illustrat by photos. Their genesis is discussed. S. I. T.

ABBREVIATIONS AND SYMBOLS

used in the text of abstracts

M.M. .. Mineralogical Magazine : M.A. .. Mineralogical Abstracts : A.M. .. American Mineralogist

CHEMICAL & PHYSICAL-CHEMICAL

cation-exchange-capacity	c.e.c.
differential thermal analysis	d.t.a.
equivalent U_3O_8	eU_3O_8
ethylenediaminetetra-acetic acid	EDTA
heat of formation (absolute temperature subscript)	ΔH_f
ionic potential, e.g.	pH
insoluble residue	insol. res.
isotopes, e.g.	^{40}A, ^{40}K
loss on ignition	ign. loss
milliequivalent	me.
microgramme	μg
million-years	m.y.
not determined	n.d.
not found	nt. fd.
not present	nil
parts per million	p.p.m.
strength of solution, normal	*N*
— — — molar	*M*
substances in ionic state	
anions, e.g.	Cl^-, SO_4^{2-}
cations, e.g.	K^+, Fe^{3+}
valency, e.g.	Cl^I, Fe^{II}, Fe^{III}

CRYSTALLOGRAPHIC & STRUCTURAL

Ångstrom unit (10^{-8} cm)	Å
crystal axes	*a*, *b*, *c*
— face indices	(hkl)
— form indices	{hkl}
— zone indices	[hkl]
indices of X-ray diffractions	hkl
intensity,	*I*
— relative	I/I_0
interplanar spacing	*d*
mica structural polymorphs	$1M_1$, $2M_1$
Siegbahn units	kX
space group. These words will be written in full	
unit cell, formula units	*Z*
— — repeat distances	*a*, *b*, *c*
— — reciprocal lattice lengths of edges	a^*, b^*, c^*
— — interaxial angles direct lattice	α, β, γ
— — — — reciprocal lattice	α^*, β^*, γ^*

OPTICAL

dispersion, e.g.	$r > v$
extinction angle, e.g.	$\gamma : c$
optic axial angle	2V
— — plane	O.A.P.
refractive index, in text	refr. ind.
— — of isotropic mineral	*n*
refractive indices	
of uniaxial mineral	ω, ε
of biaxial mineral	α, β, γ
sign of biaxiality	
negative	− or $2V_\alpha$
positive	+ or $2V_\gamma$

PHYSICAL (*other*)

calorie	cal.
calorie, large	kcal.
cycles per second	c/s
degree centigrade	°C
density	*D* (quote units)
— , relative, e.g.	D_4^{20}
gramme	g
hardness	H.
melting-point	m.p.
micron (10^{-4} cm)	μ
millimicron (10^{-7} cm)	mμ
pounds per square inch	lb/in^2
soluble	sol.
specific gravity, terms of reference not known	sp. gr.
wavelength	λ

SYMBOLS

approximately equal to	≈
equal to	=
equal to or greater than	≥
equal to or less than	≤
greater than	>
less than	<
not equal to	≠
parallel to	∥
per cent.	%
per mille	‰
perpendicular to	⊥
proportional to	∝

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